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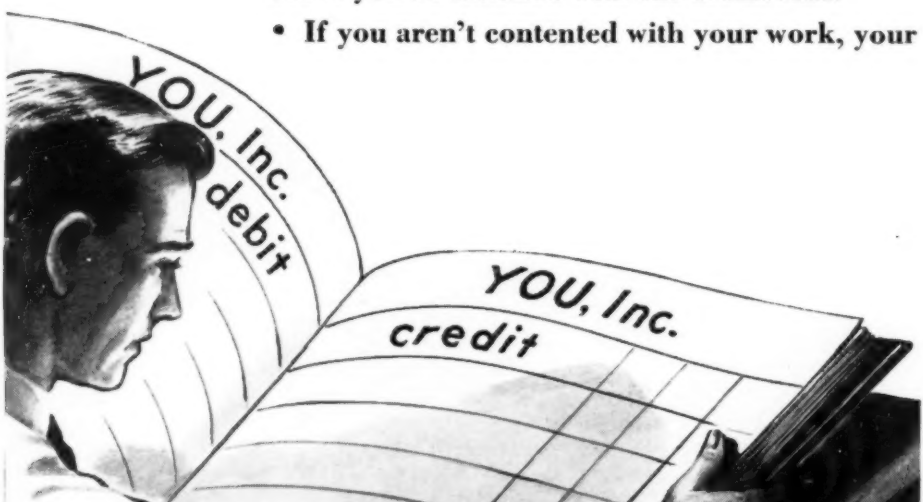

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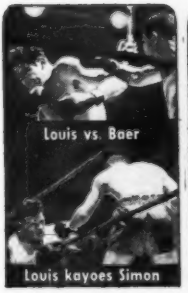

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YOUR INVENTION CLINIC

Conducted by

JOSEPH H. KRAUS

Mr. Kraus has been giving advice to inventors for more than 20 years. He will attempt to answer as many letters from inventors as possible in his column each month. Mr. Kraus will "call his shots as he sees them" in this column. Thoroughly versed on inventions and inventions procedure, he will never, under any circumstances, disclose any valuable secrets. He cannot answer questions relating to patent law. For such information, the Editors suggest you communicate with any one of the patent attorneys who advertise in MECHANIX ILLUSTRATED.

Perspective Drawings

John H. Curtis, Dunnellen, N. J., asks whether it is permissible to make a drawing in perspective in a patent application.

ANSWER: *Yes, it is. In fact, sometimes a perspective is the only way details of the component parts of a mechanism can be presented properly.*

Fluorescent Lamp

1st Sgt. Henry D. Withers, Wilmington, Cal., forwards a sketch of a spiral type of fluorescent lamp and would like to know the merits of his idea.

ANSWER: *It is customary for the inventor to outline the merits of his brain child. Frankly, we see no merit to this idea at all. You have a badly exposed hot lead. Even if this were returned to the base we still find no advantage in the spiral.*

About five years ago this writer designed a flourescent lamp and transformer combination. The lamp, a flat spiral, was intended for "cold light" in photo enlargers. The advantage here was that the light was all in one plane. But in your design the spiral merely imitates the illumination produced by an inside frosted incandescent bulb; the construction is much more fragile; it does not serve as a substitute for an incandescent bulb nor is it likely to produce much light.

We would recommend that you try to develop a fluorescent bulb which can be screwed into any lamp socket, (to work on a 110-Volt circuit), without a transformer. Experimentally this has been done.

Multiple Fuse

W. B. Pardee, Chicago, Ill., states: "I have an idea for a fuse, to be used in standard household fuse boxes, that may be used for six burn-outs before discarding.

"I do not want to describe it completely because it is unpatented. Please tell me if this idea is practical."

ANSWER: *Yes it is—so practical, in fact, that a dozen different manufacturers have produced and marketed fuses which will do exactly the same thing and which are manipulated in the same fashion as the one envisaged by you. You can buy them at any large electrical supply store.*

One of the unique fuses is the Ever-Nu. This fuse blows on an overload or short but is instantly repaired merely by shaking. It has an indefinite life.

We are afraid you can do nothing with your idea unless it presents distinct features and advantages not found in similar fuses. You have not described your modifications; hence, our reply must be discouraging.

Radio-Controlled Torpedo

John S. Tonnik, U. S. Navy, Cal., proposes a power-driven, radio-controlled torpedo.

ANSWER: *Your design indicates merely a beginning into a field upon which much experimental work and research has been carried on. About 40 years ago Nikola Tesla demonstrated a radio-controlled motorboat. Suggestions for its use as a torpedo were disclosed at that time. And this, mind you, was in the days when radio was entirely unknown, when vacuum tubes or even crystal detectors were unheard of. Current was established to relays by the action of metal filings which cohered under the influence of high frequencies. This instrument was known as a coherer and de-coherer. John Hays Hammond demonstrated similar mechanisms fully 20 years ago and was granted a great many patents on radio controlled torpedoes. We cannot see that you have contributed anything to the present knowledge in this field, hence we advise against further procedure. But we would recommend that you examine the prior art.*

Engine in Wing Installation

A/C Harris L. Woods has developed a system for installing an airplane engine in the wing, and would like our advice.

ANSWER: *This installation appears to possess both advantages and disadvantages. The question is whether or not its points of merit offset the objections.*

We would recommend that you ask your attorney to have a search made immediately; that you establish some kind of protection, if the

[Continued on page 99]

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CHIPS *from the* EDITOR'S WORKBENCH

Get In The Contest Now!

THE big MECHANIX ILLUSTRATED Word Game Contest, with more than $5,000 in War Bonds as prizes, is well under way, and the second puzzle appears in this issue on page 63.

If you haven't entered the contest yet this is your chance to collect that big first prize of $1,500 in War Bonds, or any one of the 99 other prizes ranging from $1,000 in Bonds on down. Read the rules carefully before starting to fill out the puzzles, then sharpen up your pencils and wits and let 'er go! You'll find puzzle No. 1 reprinted in the back of the magazine, so you can begin now and get right up-to-date.

Personal Lend-Lease Needed

With millions of American boys about to open up the big push in the west front of Hitler's fortress Europe—the push that General Eisenhower has promised will bring victory, your *personal lend-lease* in blood and dollars will be more urgently needed than ever to ease the task of the lads who are going to carry the fight to the enemy and beat him.

The American Red Cross is going to ask you soon to become a part of its life-saving drive for 1944—a drive that will require $200,000,000 and 5,000,000 blood donations if its results are to equal on an undiminished scale those of 1943. There isn't a cause in the whole wide world more deserving of everything you can contribute, for your participation, no matter how small, may mean a chance and a future for some kid in uniform who might otherwise be blacked-out for keeps. Don't wait for the Red Cross to come and ask you—go right now to your nearest Red Cross station or representative and give out with the cash and corpuscles. You'll never miss a couple of bucks and a pint of blood but someone else might.

Commander Attilio Gatti

. . . . wrote about those lazy African inventors in the January issue of MI. Now he returns, page 40 of this issue, with what we consider to be a knockout yarn about how he and Mrs. Gatti and a hundred odd native architects built a veritable modern palace in the wilderness of the Belgian Congo. The Commander knows the far corners of this old earth as most of us know our living rooms. What we hadn't appreciated about him was his versatility. A painter-contractor-architect of large stature? Read it and use your own judgment.

WHEELS FROM A DERBY RACER

Tom Underwood, Box 131, Benton, Ky., built this motor scooter, using wheels from a soap box derby runner-up, and cut-down handlebars from a motorcycle. The frame is 1-inch angle iron with an oak floor board. The motor pulley belt runs to the rear wheel brake drum for simplicity. The $5.00 first prize Workbench award and a Certificate of Merit go to Tom.

Spring Is Here—Practically

Did you know that in 1943 Victory Gardeners actually raised more vegetables than did professional farmers? Well, it's a fact. In 20,000,000 Victory Gardens an unbelievable total of 8,000,000 tons of food was produced—enough to fill 800 supply ships! The cash value of this mountain of grub was at least a *billion* dollars, according to a report just issued by the National Victory Garden Institute. But if you think this is something, for-

[*Continued on page* 158]

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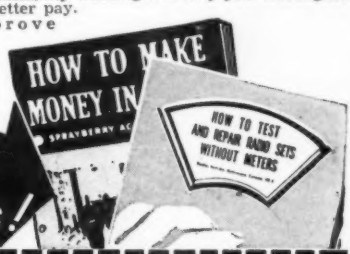

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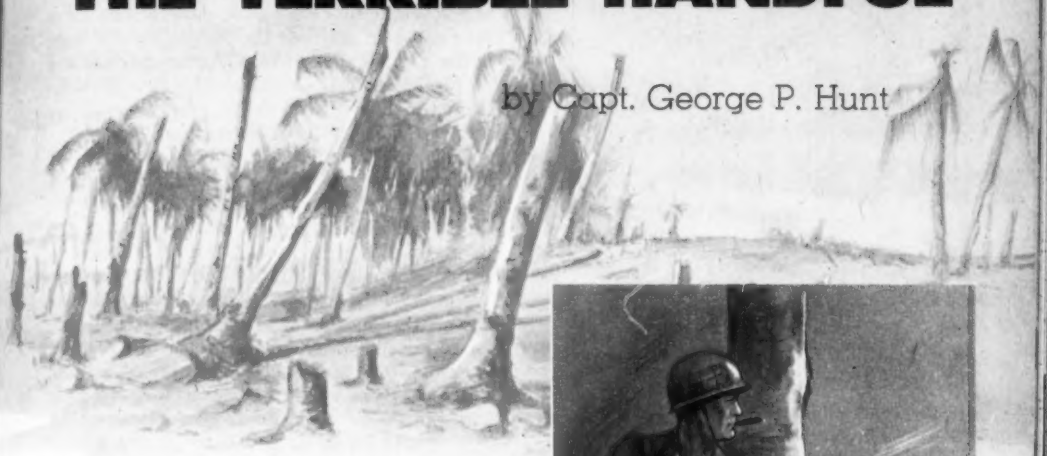
THE TERRIBLE HANDFUL

by Capt. George P. Hunt



They fought with their own guns and knives, with weapons wrested from the enemy, with guts alone—to hold the Tenaru River line.

WE HAD come down our landing nets to land on Guadalcanal less than two weeks before. We were a group of Marines that had been bombed, strafed and generally blasted until we had reached the comparative quiet of our position on the Tenaru River.

The fact that Jap warships, cruisers, destroyers, and "Oscar" the submarine shelled us most evenings for a half an hour, and that one of our patrols had ambushed and annihilated a Jap reconnaissance patrol east of our lines, indicated that an attack from the east was imminent. We figured that the bombardments from the sea were meant as distraction while nocturnal landings were in progress down the coast.

So Colonel Cates looked to the east, extended his right flank south along the Tenaru River, dug a reserve line to check any breakthrough that might be effected across the Tenaru. We were ready for the attack which came in the early morning of August 21st.

The moon waned close to midnight. Like all tropical nights when the moon is down, the darkness dropped pitch black. Occasionally white clouds scudded across the sky. In the command post we were awakened about three o'clock by sounds of firing on our front. Green and yellow flares shot into the sky; we heard the booming of mortars, the roar of the 37 mms., the loud crack of hand-grenades. Machine gun tracers clipped through the trees as far back as the command post.

Pfc. John Prout leaned against a tree and shot a Jap. He stuck a cigar in his mouth and then plugged three more. Then he calmly lit his lucky cigar.

Lieutenant Colonel Frisbie was talking to Colonel Pollock on the phone. "What's the dope, Al?" At least 500 Japs were assaulting over the sand spit which stretches across the mouth of the Tenaru River. Swiftly, effectively, Colonel Cates went to work. Sitting in front of his tent with a phone in one hand,

Until he could unjam his machine gun, Pfc. John Shea pinned a Jap in a fox hole with his right foot. Three times the enemy bayonet pierced his left leg. Finally he fixed his gun—blew the Jap's chest away.

a cigarette holder in the other, he issued his orders. To Colonel McKelvey: "Throw a company into the reserve line." To Colonel Pollock: "Hold 'til daylight, then we'll go get 'em." The Colonel sat back in his chair and impatiently waited for dawn.

Down at the point sixteen men and a Lieutenant fought for life. Waves of Japs charged across the 50-foot wide sand spit. Furious, reckless, they didn't seem to care about death, perhaps because they believed that if they died fighting for Hirohito they would sit in the Sun Goddess's lap. They stood straight up, shadowy targets; they waved their arms wildly; they shrieked and jabbered like monkeys; they were mowed down by machine guns, ripped up and down by 37's. But they kept coming.

The Lieutenant named McClanahan was wounded in the arm, the leg, the buttocks, so he couldn't shoot any more, but he lay in his foxhole fixing automatic rifles that jammed.

A grenade landed in the 37 mm. emplacement and knocked out the crew, but Marines who had never fired a 37 before leapt over the bodies of their friends and manned the gun. Their aim was just as good.

Private First Class Stuart Volan was in a foxhole with another Marine, both shooting at Japs with their Springfields. They were picking them off as they tried to out flank them by charging along the water's edge. Volan knew that a figure was also lying in the hole, wounded, perhaps dead. It had been there for ten minutes. But out of the corner of his eye he saw the figure come to life, raise his right arm and stab the Marine next to him in the back. Quickly Pfc. Volan swung around on his knees, saw the arm raise, the bayonet dripping blood, and in a split second he plugged the Jap through the chest.

Corporal Theodore Cogswell saw three Marines give a few feet of ground. He roared: "Remember you're Marines, they don't do that!" and he bayoneted a Jap officer through the neck. Then he yanked the Jap's Samurai sword from its scabbard, whirled it over his head, "Come on, you guys, let's get the bastards!" Men rose from their foxholes to follow Corporal Theodore Cogswell, to hurl the Japs from the beach.

From across the river the Japs opened up with mortars and heavy machine guns. Bullets and shrapnel flew through the smoky blackness that hung over the point. Over the Jap dead drifted gunpowder fumes, and from across the spit rolled a smoke screen.

In the command post Colonel Cates consulted Lieutenant Colonel Lucky, expert artilleryman; at 0320 decided to call for an artillery barrage. Over the phone Colonel Lucky, cool as a man ordering a quart of ice cream from the corner drugstore, stated the fire mission: the concentration, range, direction. It went to the fire direction control, down to the men on the guns. Into the breeches the number two men rammed deadly high explosive shells; the number one men waited to yank the lanyards. The battery's executive officer shouted the command "Fire!"

Corp. Dean Wilson's Browning Automatic jammed while Japs charged. He hurled his rifle aside, grabbed a machete and slashed the first Jap so savagely across the stomach that his entrails fell out on the ground.

and almost simultaneously artillery roared into action.

Volley after volley thundered. At 0340 Colonel Cates had a hunch that the Japs might be digging in east of the river a few hundred yards, possibly bringing up reserves. He ordered a shift in the fire mission, right 300, down 100. As was revealed after the battle, the hunch was right. Scores of maimed corpses were found sprawled in and out of half-dug foxholes. Helpless, with no cover, the rear units of the Jap force were caught in the terrific shelling. Many had tried to run back, but the shrapnel had cut them down in their tracks.

Meanwhile the fight on the point grew hotter. Near the 37 mm. gun rose the cry for a corpsman. So up strode George Orson La Due, carrot-topped with a flaming red beard, who bent over the prostrate forms of the wounded, gave them morphine, dressed their wounds as best he could in the hail of bullets.

Corporal Dean Wilson was shooting Japs with a B.A.R. (Browning Automatic Rifle). Three of them loomed out of the smoke and charged his foxhole. The B.A.R. jammed, so Wilson threw it aside, grabbed a machete and slashed the first Jap across the stomach so hard that his entrails fell out. He jumped out of his hole, rushed the other two and hacked them to pieces.

Over on the right flank of the skirmish line Private Rivers was just waiting. In front of him was his heavy machine gun. He had waited many a day for the moment which he knew would come soon, the machine gunner's dream. So he continued to wait, and when enough Japs had gathered in his line of fire for him to make a good kill and not waste a shot, he pulled the trigger. They toppled like ten-pins.

After forty-five minutes of rushing our defenses the Japs had not made a break through. But they continued to attack through the sheet of fire. Reinforcements arrived—Lieutenant Codrea with three squads, deployed his men across the nose of the point. Private First Class John Shea came up with Lieutenant Codrea and was lying next to him firing a Tommy Gun. It jammed so he pointed to a foxhole and asked the Lieutenant if he could go there and fix it. Through the terrific din, the hoarse yelling, he heard his Lieutenant say, "Yes, go ahead." He crawled over to the hole, swung himself in on top of a Jap. He felt a bayonet pierce his left leg twice, and he caught the Jap in the stomach with his foot and pressed him with all his might against the wall of the foxhole. Again the red hot blade ran through his thigh. He struggled with his Tommy Gun, finally released the bolt and shot the Jap five times through the chest. Then he pulled himself back to his Lieutenant, dragging a bloody leg.

A hand-grenade hit near Codrea and cut up his arm, and he was ordered back to the shore road where he lay down weak from loss of blood. A squad was moving along

Three Marines had given a few feet of ground. Corp. Theodore Cogswell bayoneted a Jap officer through the neck, yanked his Samurai sword from its scabbard and led a murderous charge.

the road headed for the front line, led by Corporal Spillane who is good for a fight in anybody's war. His men hit the deck when a mortar struck very close, but didn't get up fast enough for Corporal Spillane who bellowed "What's de matter wid you guys, ye scared?" Lieutenant Codrea, seeing the momentary hesitation, forgot his wounded arm and ran out in front of the squad of men and in no uncertain terms told them to get up and follow him. When they saw him racing through the bullet-storm to the tip of the point, they raced after him. Three bullets whizzed through the top of Corporal Spillane's helmet, missed his head by a hair. He cussed and got another tin hat from a dead man.

Dawn began to break, and the Japs were making their last desperate attempt to cross the spit. Under the Jap charge the front line buckled. Out of the smoke and the powder came a blast from Platoon Sergeant Robinson, deep-throated like a fog horn, "Gawddammit, you're going the wrong way! What the hell is this, the Japs are over there!" The counter-charge gathered momentum; men lunged and plunged their bayonets home and drove the Japs back across the spit.

As the sun came up over the ocean the men saw their Colonel, ice-cool, caring as little for bullets as he did for Japs, walking up and down the firing line. Bullets flew close to Colonel Pollock but never hit him. He directed mortar and 37 mm. fire, cautioned his men not to waste a shot. "All right, men, imagine yourself on the rifle range; line 'em up and squeeze 'em off." Before him the men showed their stuff and plugged Japs by the score. Private First Class John Prout leaned against a tree, coolly squinted through the sight of his Springfield and shot a Jap. Just as deliberately he fished in his pocket and stuck a cigar in his mouth. Again he raised his rifle, pulled the trigger and shot another Jap, then two more. Then John Prout set his rifle against the tree and lit his cigar.

In the command post Colonel Cates was giving orders to Lieutenant Colonel Cresswell to cross the river to the south—cut to the sea and envelop the Japs. He asked for more artillery concentrations, tanks to roll over the spit and complete mopping up.

During the day the battle became cold-blooded annihilation. Into the cocoanuts pounded mortar shells, scattering ragged chunks of metal among the ill-fated Japs. They fled in panic, stumbling over the fallen palms, running frantically down the beach. Some even plunged into the ocean, swam straight out until they were either picked off from the shore or drowned from exhaustion. If the artillery didn't get them, Cresswell's men, driving in from the southeast, got them. Then the tanks rumbled over the spit, belched death into the bloody cocoanuts. Jap snipers fell out of the tree tops, faked being dead behind their own dead and sniped at unsuspecting Marines. For more effective deception some smeared blood over themselves. Overhead Grummans zoomed low and strafed the last fleeing remnants, and as the afternoon was fading the din diminished to the occasional crack of a rifle. Then night fell over the starkly grim battlefield.

What about this handful of men who held

Two Marines and a still figure lay in a shell hole. The supposed corpse rose up and stabbed one of the Marines in the back. Quickly the other Marine, Pfc. Volan swung around, drilled the Jap in the heart.

the point 'til dawn, who hurled back the 800 or more Japs who stormed across the sand spit? Here's something about some of them, just samples of what the rest are like.

Here's McClanahan, the lieutenant, who was wounded and couldn't shoot anymore, so helped other men to shoot. He is tall, wiry, black-headed and has eyes the color of night.

Here's Private First Class Stuart Volan who tangled with a Jap playing possum in his foxhole. He had worked as an automobile salesman for Ford, a dancing instructor for Arthur Murray, and hails from Syracuse, N. Y., where he went to college.

Here's Corporal Theodore Cogswell, tough, rugged, who isn't satisfied unless he's in action, who has done everything from chasing cattle in California to working in a machine shop in Connecticut. After he led the charge with the Samurai sword flashing over his head, shrapnel caught him in both feet. But he's back in action [*Continued on page* 157]

JET-DRIVEN DEVIL

ALLIED air forces will soon take into action a revolutionary jet-driven fighter, said to look like a P-38 minus propellers. By sucking in air, mixing it with fuel, and expelling jets of exhaust gases, the ship achieves speeds of 500 to 600 m.p.h., soars high into the sub-stratosphere. Inventor is Group Capt. Frank Whittle of the RAF, at left. The new plane has tremendous lifting power, allows greater bomb loads, requires less armor and armament. It uses a smaller take-off area, produces little vibration, can slip noiselessly over its target, cuts pilot fatigue way down. Sketch above is conception of MI staff artist based on newspaper reports stating the resemblance to the P-38.

I'VE GOT A CASTLE ON THE RIVER NILE

by Commander Attilio Gatti

You are in the Belgian Congo, suffering from alternate doses of steaming heat and chilling dampness. You love your former comfortable home-life with modern design. Now, what do you do?

WE HAD been camped less than two weeks in a clearing buried deep in the unknown immensities of the Kigali-Ituri Jungle of Belgian Congo, when we came to the conclusion that something drastic had to be done—and quick.

At our disposal was an abundance of the most wonderful custom-made tents ever seen in Central Africa. We wore clothes and boots of a type which we had studied and perfected for years. Our expedition had lavish stores of every kind of materiel, practically everything we would need for a year's stay. And everything we had was packed in metal cases, in specially treated wooden boxes, or in canvas bags which had been guaranteed to us as waterproof and insectproof.

And—to what avail had been all these costly, painstaking precautions?

Every object made of wood was so swollen it was perennially stuck. Everything made of metal would become red with rust under our eyes the moment we wiped the grease off it in order to use it. Whatever was made of anything else was as limp, discouraged and sticky as cold spaghetti. Strange bugs, some of them of monstrous size, bored great holes through the canvas bags—and anything they contained. White ants and termites took only one night to chew the bottom off a wooden case. Opening a metal box was like unsealing an ancient grave.

As for ourselves, under that unceasing alternation of steaming heat and chilly dampness, we were reduced to masses of mold—of mold shot throughout with soreness and aches and pains.

"An arthritic fungus," groaned my wife. "That's what I'll be in a year—if I survive that long!"

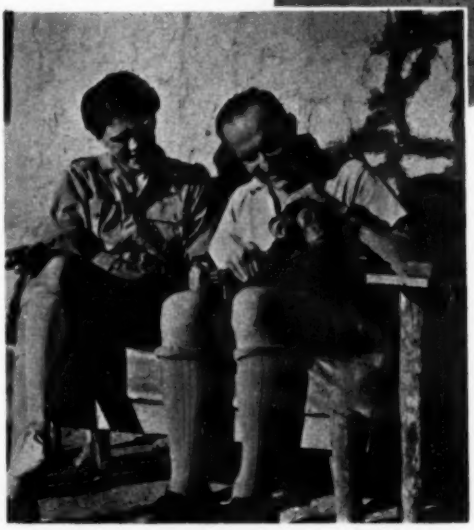
"Okay," I said. "We'll build ourselves a hut. How's that?"

"Great!" she answered dubiously. "But what with?"

"The jungle," I grandly answered. "With what it offers in unending quantities, with what we have, and our hundred porters, why—it won't be any trouble at all."

Any trouble at all, my eye!

Luckily, however, at the moment we didn't know what we were in for. And Basily, the



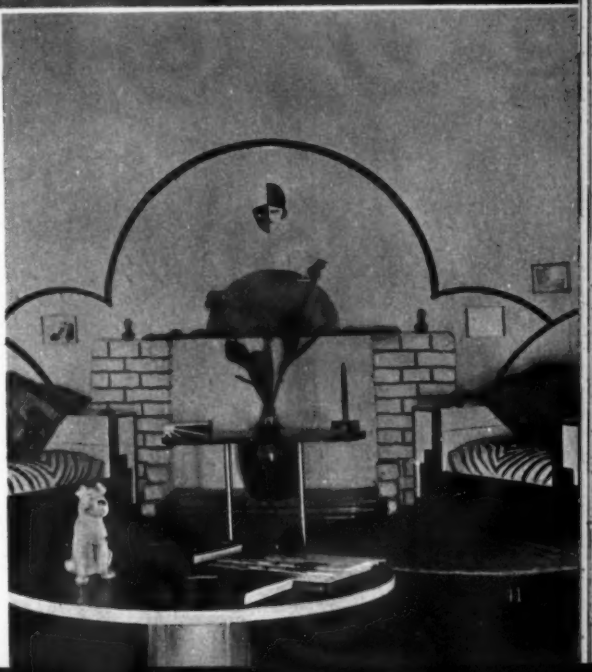
"Baboon butler waiting at the door." But this was a chimpanzee that, instead of waiting on Commander and Mrs. Gatti, compelled them to play butler for him.

The author's home in Darkest Africa, not Miami. Nearest town is 1,000 miles, closest road a two day's march.

head of our porters, highly approved of our plans.

At any rate, the hundred men under him were put to work at once. For a fortnight they did nothing but chop down huge trees, drag them away, rip out stumps whose roots seemed to reach down to the bowels of the earth, gather and burn underbrush, level and pound the soft soil.

Finally the site was ready. And, armed with sticks and string, my wife and I began to mark on the ground the floor plan.



From a wrecked truck came chairs and tables, the fireplace fender. Gas cans, native mats, mud and art work in ochre do the rest.

"Ceiling reed mats by the natives. One of my wife's dresses at the windows. An elephant dung and anthcap soil flooring."

That was the pitfall into which the "hut" idea vanished and from which the "castle" headache emerged.

"While we are at it," suggested my wife, "why not make the rooms a little larger?"

"Sure," I contributed. "Let's add a nice living room, too."

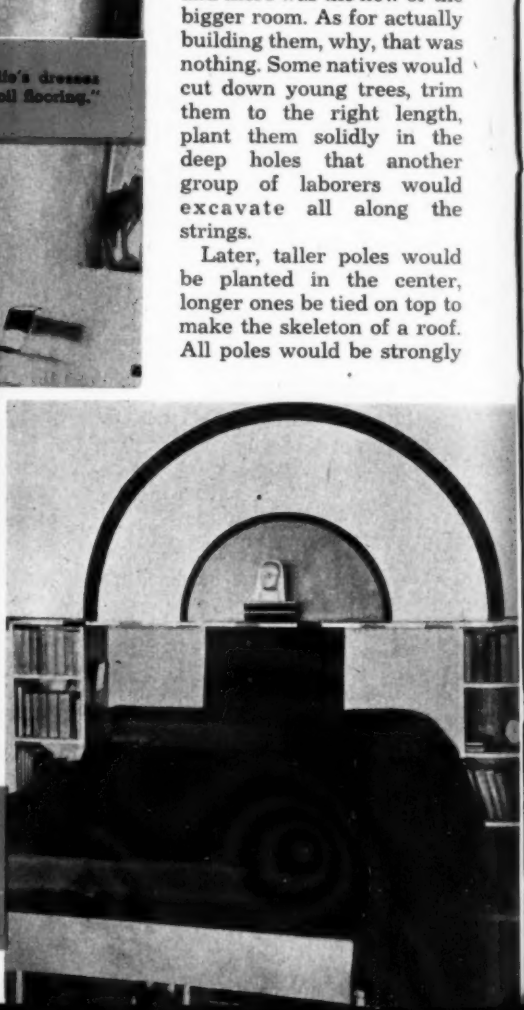
"And a dining room," sighed she.

"And a bathroom, of course," I finished off.

You see, it all sounded so simple, then. You just planted four more sticks in the ground, connected them with a neat length of string, and there was the new or the bigger room. As for actually building them, why, that was nothing. Some natives would cut down young trees, trim them to the right length, plant them solidly in the deep holes that another group of laborers would excavate all along the strings.

Later, taller poles would be planted in the center, longer ones be tied on top to make the skeleton of a roof. All poles would be strongly

Bicycle crates and truck metal made a 5th Ave. chair for a guest. That's the truck's clock, too. Wild kapok mattresses—broken crate shelves—native ivory sculpture—a bedroom for a king.



fastened together with lianas and creepers. Then, over the roof, huge *magongo* leaves would be disposed in tile fashion and a thick layer of grass be compressed on top of them.

As for the walls, it was only a question of slapping lumps of mud between pole and pole, then of covering with the same system the whole inside and the whole outside. So, even if we made the rooms bigger or added a few new ones, what was the difference?

The difference was that, despite the extravagant lavishness of material at our disposal and another hundred men that we brought up from the road to help, it took an eternity before the construction was finished. At least, Basily finally pronounced it finished. Actually, at the end of those six weeks of bestial work, the place was simply uninhabitable. The mud of the walls, in drying, had formed an extravagant number of cracks. The pattern they formed was striking, to be sure. But, then, so were the droves of bugs of every possible and impossible sort which took full advantage of them to fly in and crawl around in—and remain trapped inside.

Once the cracks were filled with fresh mud, the invasion ceased. But the place, despite the original windows we had improvised out of roughly sawed mahogany and metal screen, was as dark and gloomy as a catacomb. Furthermore, deep outside ditch and elevation of the floor notwithstanding, the inside appeared to be even more drenched with humidity than the outside. Finally, our famous "bathroom" was a dreary cubicle filled only with emptiness. And, in the other "rooms," our camp furniture which in the compactness of tents had seemed so luxurious, was now completely lost, simply serving to crown the already disastrous impression of general utter desolation.

It was then that, finding ourselves so rudely

[*Continued on page* 146]

The Gattis keep the Congo dampness out. "Our gas drum, interlocking gas corn chimneys kept us comparatively smoke free."

Huge magongo leaves are laid tile-like, grass is compressed on top. Columns have not yet been marbleized with Congo mud.

GREEN DRAGONS

Official U. S. Navy Photos

BY NIGHT, sudden death for the Japs slips out of river mouths and inlets of New Guinea island groups. These PT boats are fearfully called Green Dragons by the enemy. Overhanging trees and their own camouflage lend them comparative safety by day, while their crews live in bases bogged in "gumbo" mud. They had a potent part in blasting the Japs out of Lae.

A torpedo-firing reptile blends naturally into the jungle background at its base in the South Pacific.

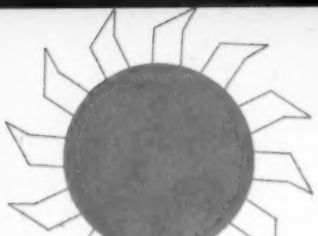
A base-building truck fights its way through the sticky, sucking "gumbo" soil of a tropical island.

Green Dragoners take their Monday-morning-quarterbacking seriously after a night raid on the Nips.

A Green Dragoner marksman draws a bead with his twin "fifties" over a blackened, southern ocean.

Get ready—get set—to roar like hell at night out of the oily river mouth of some New Guinea river.

Darkness descends. A warmed-up PT squadron frees itself from the jungle at mission zero hour.



CYCLES PREDICT

Will revolutions break out in Europe soon? When will you be most efficient? Cycles answer these and dozens of other questions you may ask.

THE next "Dust Bowl" drought in the United States should not occur before 1975.

The years 1948-1949 should be excellent ones for vintage wines.

This year—1944—may bring either little movement in stock market prices, or considerable swings in either direction, but 1945 will be a period of strong upward movement, with stock values in November and December definitely higher than in January of that year.

Four out of the six decades remaining in this century will be cold; the world is just moving out of a warm epoch. The next 5 years should be progressively colder, warming up temporarily in the early 1950's.

Persons born between mid-January and mid-April, have, on the average, two years' longer life expectancy than those born in July or August (in U. S. temperate regions).

If you are going to take a civil service examination, or any other test requiring intellectual alertness, take it in the fall instead of in summer. Mental efficiency, highest in autumn, enables 75% of applicants to pass civil service tests, whereas in summer only 58% succeed.

Your physical efficiency in May is about 15% higher than in January; it will slacken during the summer but reach a peak in September, October.

Should you awaken at 2 a. m. tonight, problems which you meet successfully by day will seem insurmountable. This is the ebb period of human energies, the hour of despair, a favored striking-time for death in illness, when the human organism has for long hours been shut out from the radiant energy of sunlight.

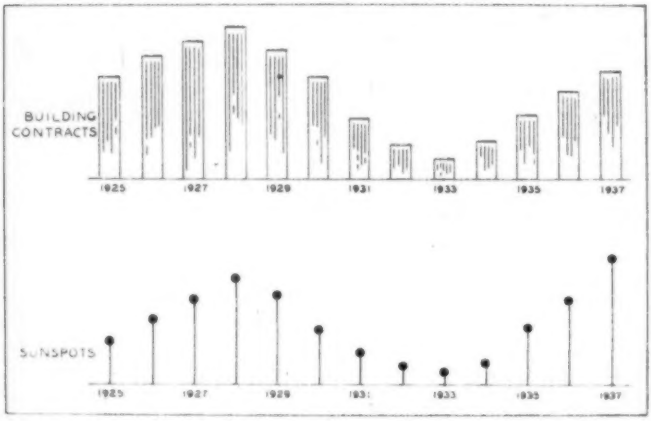
The world's birth rate, with minor recessions, should continue to climb until the latter years of this century.

Economic conditions in 1954 should be roughly comparable to those of today, since business fluctuates up and down in more or less regular cycles of about a decade.

What do these apparently disassociated predictions have in common? Simply this: they have been made, not by crystal-gazers or horoscope readers, but by scores of scientists who, through tens of thousands of tedious computations stretching far back into history, have discovered the cyclical nature of human phenomena.

Very few things—in fact, probably none—are unaffected by cycles. Even the rocks present evidences of cycles lasting thousands of years. In shorter terms, it is common knowledge that a period of boom business conditions is eventually followed by a recession. A cycle is merely a periodicity—that is, a condition which runs its course, comes back to its starting point, and begins over again.

Since cycles have been repeating since the beginning of time, we have only to chart their course,



During the 11½-year sunspot cycle extending from 1925 to 1937, building activity seemed to parallel sunspot activity almost precisely, as chart shows.

THE FUTURE

by Donald G. Cooley

measure their duration, to predict *scientifically* what is going to happen in the future, and *when*.

To be sure, this is no easy task. There are little cycles riding on the backs of big ones, and some cycles (as in glaciation) encompass tens of centuries. But already sufficient progress has been made so that we may, with a high degree of accuracy, forecast weather changes, the course of wars, trends in government, religious and social movements, economic conditions, and even such highly personal things as the best time of year for conception of children, fertility, your times of highest mental and physical efficiency, onset of epidemics, length of life, when to expect the "blues" and when to anticipate that on-top-of-the-world feeling, and so on.

Dr. Raymond H. Wheeler (second from right) of the University of Kansas is shown with the 1,000-page, 110-pound manuscript he has filled with data correlating world history with weather cycles.

A tall order? Unquestionably, but the cycle experts are beginning to give us astonishingly accurate methods of predicting all these things and many others.

Let us, to begin with, examine a few cycles that have been definitely established or suspected, and see what they mean to us.

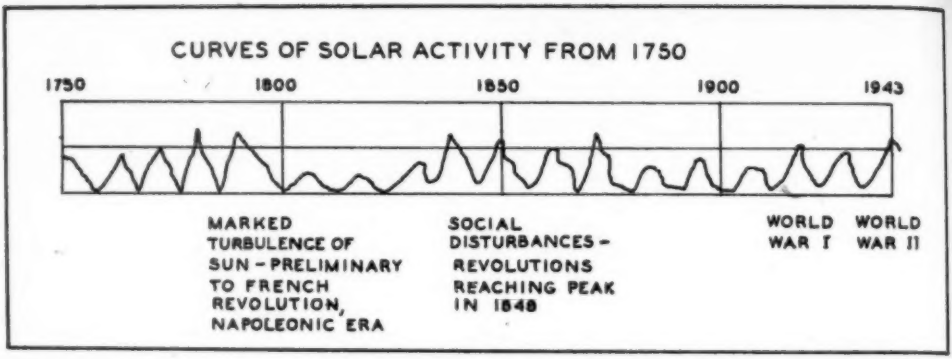
The sunspot cycle, known to the ancient Chinese, is one of the most familiar. Every 11⅓ years, on the average, the sun bursts out in a new series of gigantic gaseous eruptions which, in the opinion of such weather scientists as Dr. Charles Greeley Abbot of the Smithsonian Institute, bring characteristic changes in the world's weather. As sunspots approach a maximum, world weather is generally colder. Last May a new sunspot cycle began; until 1948-1949, therefore, we may expect progressively cooler weather.

A weather cycle of 23 years—double the sunspot cycle—Dr. Abbot finds most significant, and also a 46-year cycle. Applying the latter cycle to the Dust Bowl droughts of the 1930's, a new drought around 1975 appears likely. Cutting down of trees and plowing of grasslands, charged with responsibility for Dust Bowl conditions, may merely contribute to deeper cyclic causes beyond man's control.

A period of 11.3 years is *average* for sunspot cycles, but many workers, such as Henry Helm Clayton, stress that such cycles can vary from 8 to 16 years. Clayton detects cycles of 37, 77, 83, and perhaps 252 and 300 years affecting sunspot periodicities, showing the necessity for relating longer to shorter cycles for accurate prediction.

But what difference do sunspot cycles make? Probably more than we suspect. Dr. Harlan True Stetson, astronomer of Massachusetts Institute of Technology, is one of several scientists who make an impressive case for the effects of sunspots on human behavior, growing things, business conditions. Four of the last five major depressions, he points out, have followed in the wake of a sunspot maximum. Best years for wine vintages correspond impressively with sunspot maxima.

How could sunspots affect human conduct as reflected in such things as stock market prices? It is well established that when the air we breathe is ionized (contains electrically charged atoms) we are more energetic, optimistic. By electrical methods, the air of a room can be charged to make a party gay and lively, or by turning off the mechanism, guests become sleepy and go home. Sunspots are definitely linked with magnetic storms which disrupt radio communication; their "electrify-



The chart above shows the ups and downs of sunspot activity from 1750 to the present time. A study of history seems to indicate that high points of sunspot activity coincide with periods of war, revolution and panics. But scientists believe other factors may be the primary causes of such phenomena.

ing" effect is beyond the realm of theory. Conceivably, their impact upon a population could induce mass psychologies reflected in buying or selling orgies and other demonstrations reflecting inner attitudes.

The effect of solar cycles upon growing things has been dramatically demonstrated by Prof. A. E. Douglass of the University of Arizona. Prof. Douglass has studied thousands of tree rings (annual patterns of growth visible when a tree-trunk is cut crosswise) going back as far as 1300 A.D. Strikingly, he found the rings tending to group in clusters of ten to a dozen, corresponding impressively through the centuries to the general length of solar cycles.

When ancient glaciers melted rapidly they laid down a thick layer of sediment during a season; when weather was colder and they thawed slowly, the deposit was thin. The response of long-gone glaciers to climate is preserved today in sedimentary clays, known as varves; the interval between thick and thin layers averages 11.4 years—practically the solar cycle.

A major tendency of stock market prices to recur every ten years has been traced by Edgar Lawrence Smith. Each ten-year cycle includes three shorter ones of 40 months each. Carlos Garcia-Mata and Felix J. Schaffner, working on grants from the committee on research in social science of Harvard University, produced a study linking stock market prices with sunspot activity—generally, the more active the sunspots, the more "bullish" the market.

The number of short cycles of approximate 10-year length is impressive, suggesting a common cause. Hudson's Bay Company records going back to 1844 show a 9.75 year periodicity in offerings of lynx skins; tent caterpillars in New Jersey, abundance of salmon in eastern Canada, fluctuations in bird, game and animal life show practically the same cycle. Rhythms of approximately 40 months (one-third of a ten-year cycle) are also common, as in common stock prices, pig iron production, public utility sales—corresponding to an exact period of 40.8 months in variations in heat received on earth from the sun, as determined by Dr. Stern of Harvard College Observatory.

Cycles can be extremely personal. Temperature cycles have a great deal to do with your physical and mental efficiency. Rats raised at temperature levels of 65° are *four times as smart* in maze tests as rats raised at 90° temperatures. Dr. Clarence Mills of the University of Cincinnati has pointed out how weather cycles affect human intelligence: students taking aptitude tests in the fall score much higher than those taking summer tests.

The effect of weather on patients, altering moods, blood pressure, and glandular relationships in cyclical fashion, has been exhaustively studied by Dr. William F. Petersen of the University of Chicago. And Ellsworth Huntington, climatologist of Yale University, has delved into some astounding cycles. He finds, for instance, that in temperate zones, persons born in February and March live longer (about two years) than those born in July; September and October births have the next best chance of longevity. This is attributed to seasonal cycles which leave the parents of late-winter babies in more robust condition at time of conception. Indeed, in hot weather conceptions diminish—not only annually, but in longer cycles. During the hot-drought period of the 1930's, birth rates all

over the world fell alarmingly, and nothing the fascist dictators were able to do about it changed the situation.

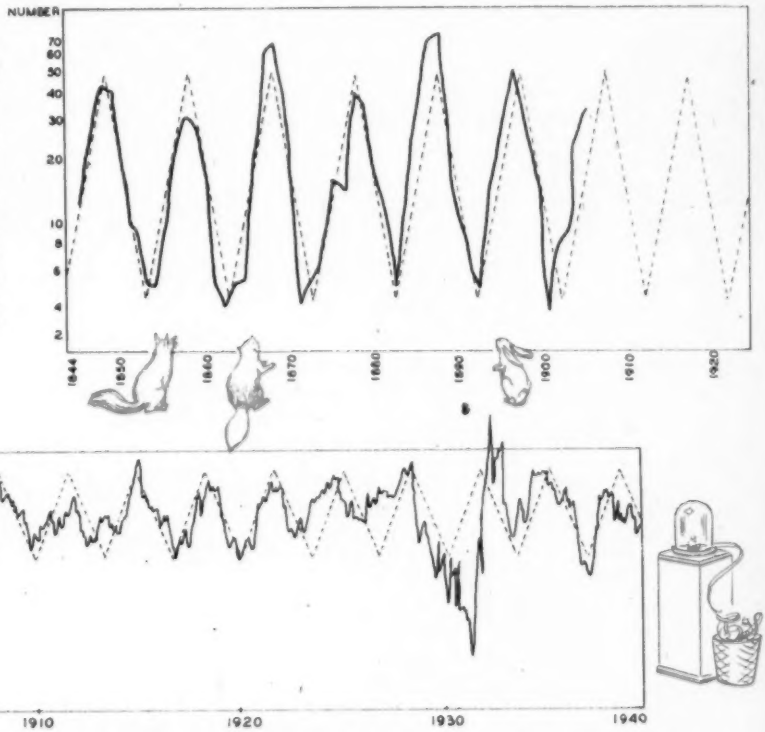
The cycles thus far mentioned are but a very, very few of those thus far charted. It is significant that all of them are susceptible to explanation in terms of climate or the ultimate causes of weather and climate. Plants grow because they receive solar energy; rainfall varies with weather cycles, bringing good or poor crops; crops affect commodity prices; radiant energy from the sun affects human psychology (else why are we optimistic in the sunshine?)—in short, radiation cycles appear to run like a red thread through all human activities.

We are still, of course, a long way from knowing all the answers. It is not to be presumed that any single investigator has yet found the universal key. There are, as we have seen, cycles within cycles requiring painstaking work to trace the red thread.

But it is being done, giving us a new key to the future, and cycle studies have advanced to such a degree that the stage of coordinating scattered findings has already been reached. The Foundation for the Study of Cycles, under the directorship of Edward Russell Dewey, has been established as a clearing-house for cycle information. Its services are used by business executives who need a scientific forecast of future conditions in order to decide upon investments, inventories, plant construction, etc.

The most comprehensive study of cycles thus far undertaken is headed by Dr. Raymond Holder Wheeler of the University of Kansas. Dr. Wheeler, a psychologist, began by charting fluctuations in human thought through the centuries. He found surprising rhythms: "swings" in art, literature, music, politics, repeated themselves with uncanny regularity. Democracy was followed by dictatorships, romanticism by classicism, international wars by civil wars, etc. Eventually Dr. Wheeler heard of Prof. Douglass's treering studies, which we have already mentioned. Could these curves of tree growth, representing climatic fluctuations through the ages, correspond with the purely human cycles Dr. Wheeler had discovered?

They could, and [*Continued on page* 152]



TOP CHART: The Hudson's Bay Company kept a record of furs which it purchased over a period of nearly 100 years. It discovered there was a "cycle" in the number of furs reaching its trading posts. Every 9.75 years, furs dropped to a low. BOTTOM CHART: It has been discovered that there is a cycle of 40.8 months in ups and downs of the stock market. Dotted lines show the true 40.8-month periodicity while the heavy lines indicate the actual stock market fluctuations.

MAGIC CLOAK OF INVISIBILITY

One of the war's great mysteries is explained with the revelation of a strange new weapon perfected by the U. S. It may result in cutting American casualties in half.

American infantrymen step out of a smokescreen in maneuvers.

by W. H. Kimball

THE greatest mystery of the present war, thus far, has been the fall of Fort Eben Emael in Belgium in that disastrous May of 1940 when the Nazis swept across the lowlands into France.

Fort Eben Emael was "impregnable." It was said to be stronger even than the Maginot Line. Yet the Nazis took it in one short morning.

At once, all manner of stories started circulating about the secret weapons the Germans had used to breach this stronghold. First a story was heard that spies had drugged the entire garrison. Next it was related that the Nazis had used a strange "paralysis gas." According to this yarn, the German soldiers walked into the fort unopposed, to find each member of the garrison at his appointed station but frozen stiff in paralysis.

Next, a story appeared in the Swedish press saying that Eben Emael was captured by glider troops in silent gliders which were equipped with nose "flame guns." As the gliders came out of the sky, according to this account, their nose guns belched great sheets of flame which completely enveloped the fort and burned all the defenders to a crisp.

And, finally, the Nazi press, ever alert to the value of psychological warfare, gave its own version of the breaching of Eben Emael. It was "nerve gas," Herr Goebbels said, that knocked out the garrison and enabled the Hitlerites to capture the fort "without firing a shot."

Now, at last, it is possible to clear up the mystery of Eben Emael. It was *smoke* that did it. Nothing more mysterious than that. Officers of the Chemical Warfare Service of the U. S. Army announced this fact, on the

basis of a careful examination of numerous reports on the subject.

The announcement brought to light the interesting fact that smoke—plain, old-fashioned smoke like that coming out of your chimney—has become one of the most important weapons in the arsenal of warfare.

The Germans, attacking Eben Emael, brought up small mortars which lobbed smoke shells in and around the fort until it was completely enveloped and its defenders couldn't see a foot ahead of their noses. Then they moved up with flame throwers and "fried out" the Belgians within. The defenders simply couldn't see to aim and fire.

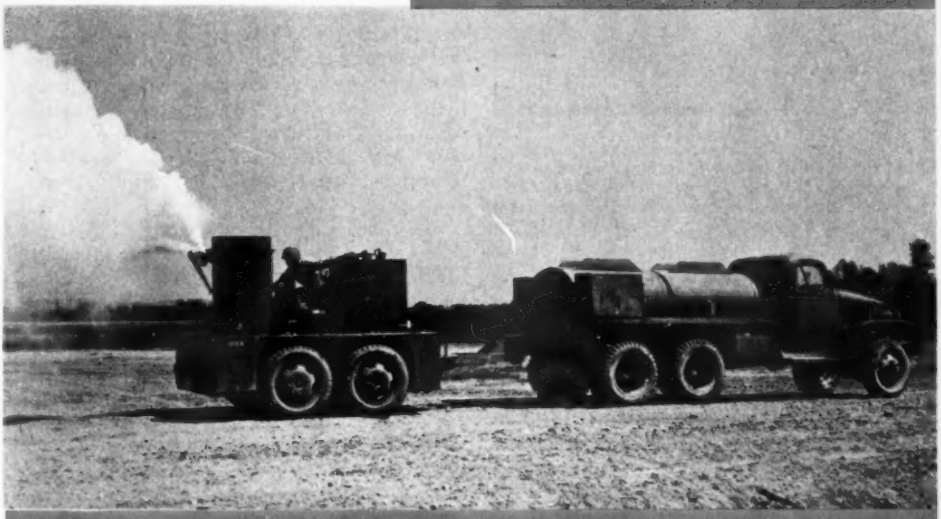
The U. S. Army has perfected and improved this Nazi weapon to the point that officials of the Chemical Warfare Service make this startling statement:

American casualties will be at least *cut in half* in this war through the use of smoke. Or, to state it more precisely, whereas in World War I a commander, in assaulting an enemy position, expected to sacrifice two men for every one man advanced, in this war the casualty expectation is less than half that rate!

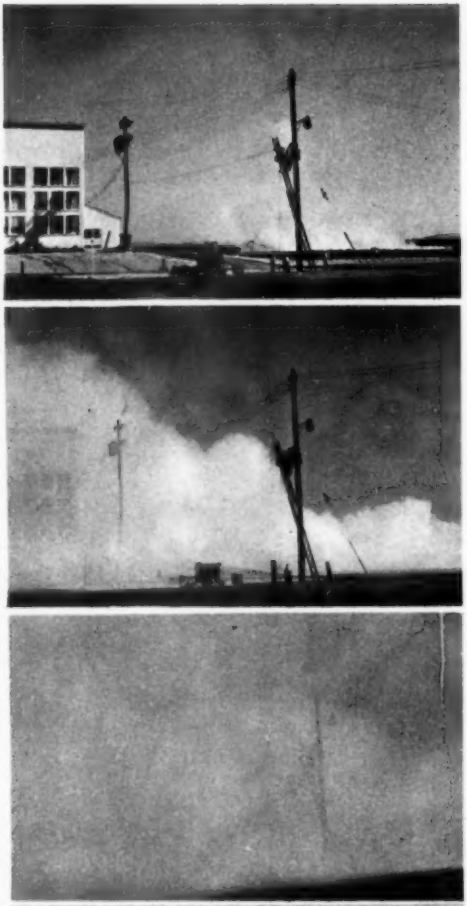
It is easy to understand this statement when you know the facts of what smoke can do. The CWS (Chemical Warfare Service) made extensive experiments with smoke and obtained the following exact figures: a group of sharpshooters, firing under normal conditions, would score 70 per cent of hits; when the same sharpshooters had been enveloped in smoke, their score would invariably drop to three to four per cent.

Smoke is a tricky thing to use. It is extremely sensitive to the weather. In dry

The new Chemical Warfare 4.2 inch mortar, secret of America's greatest strides in smoke science.



This is the M1 smoke generator, capable of blotting out an entire city.



The sequence of photos above shows an M1 smoke generator in action, blotting out an airfield from a distance of two miles in about 15 minutes time—ceiling zero made to order.

atmosphere, it dissipates rapidly. Humid air holds it to the ground. The slightest movement of air is apt to swirl it off its target. But the U. S. has learned a lot of secrets about smoke and engineers of the CWS can now make smoke behave pretty much like a trained dog.

The Nazis still have not mastered smoke as we have. Consequently, they are able to use it only when weather conditions are perfect. There are two documented instances, other than Eben Emael, where they used smoke effectively. They breached the Maginot Line near Saaralben, France, by using the same technique as that employed at Eben Emael —smoke mortars and flame throwers.

Then, in June, 1940, the Germans arrived at the Marne. This was the French Army's strongest secondary line of defense. Under ordinary circumstances, an attempt to cross the Marne and storm the heavy French fortifications would result in extremely high casualties.

The German commander, however, brought up batteries of smoke mortars. The weather was ideal for smoke operations—moist and still. Early in the morning a barrage was opened, with the batteries firing smoke shells at the rate of one every 15 seconds for several hours. The French were blinded. At the same time, German concentrations were screened by smoke. German engineers threw pontoon bridges across the river and established a bridgehead on the French shore within an hour and with only minor casualties. By the following day, the Nazis had broken through.

In this war, Americans used smoke extensively in their landings in Sicily, official reports indicating that the Sicilian coast was blanketed as far as ten miles inland. The casualties were correspondingly low. No official reports have been made as to whether smoke was used at Salerno or at Tarawa, but photographs of the Tarawa landing made it appear that the invading Americans were not able to use it as effectively as it had been used in the past. This may account for the higher casualty rate on the Tarawa beachhead.

Principal weapon of America's smoke warfare is the new 4.2 inch chemical warfare mortar. This remarkable weapon is capable of firing 20 shells a minute. It has a rifled barrel which gives it accuracy far greater than that of the standard mortars used in the last war.

The mortar also throws white phosphorus shells with devastating effect. They have been highly effective in driving the enemy out of foxholes and trenches into the open and have been used extensively in the Italian operations. The phosphorus spreads into trenches and foxholes and sets fire to the clothing of the enemy.

The Americans have also developed an artillery shell which can be used to blot out areas far in the rear of the enemy lines. This weapon was demonstrated to the public recently by the Ordnance Department of the Army. In addition, airplanes are used extensively to spread smoke screens, both in land and sea warfare.

One of the [*Continued on page* 155]

JUNIOR LIBERTY SHIP

The 27-foot model of a Liberty ship, built to exact scale of ¾-inches to the foot, complete in every detail of deck machinery, cargo booms, wildcats, capstans and winches.

NAVAL officers and members of Navy's Seabee Special Units learn the fine points of stevedoring in a novel school in New York City. Every piece of machinery on the model can be rigged and operated with the precision of its counterpart on a full-size vessel. Students practice loading, unloading with models of jeeps, tanks, planes, crates, etc.

Students load deck of a far tinier model than above. Miniature cargo is in cabinet drawers under model.

Cargo of "food" is swung over and into ship's hold. Fishing reels serve as winches for twine rigging.

CONTINENT OF TOMORROW

NO. 5: PERU

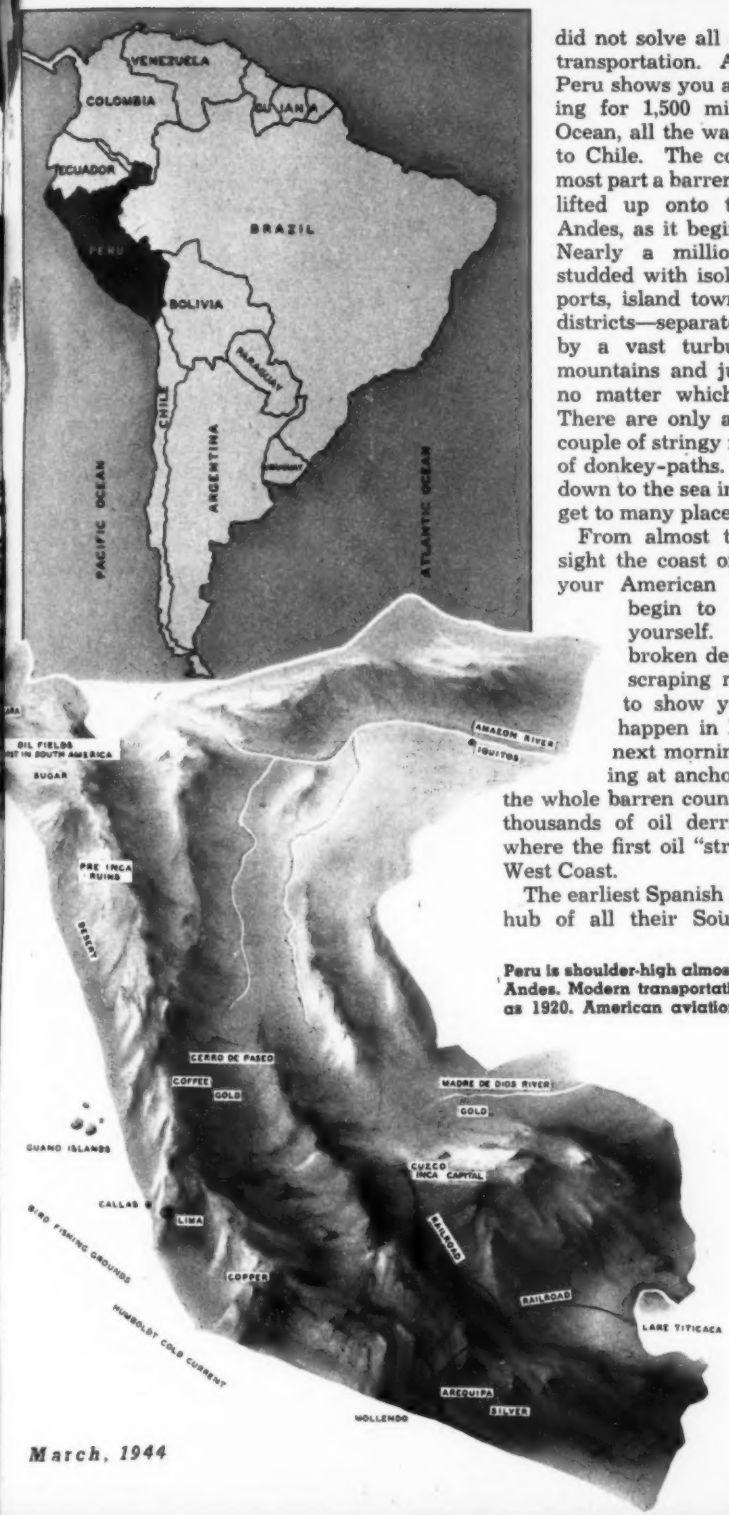
by Henry Albert Phillips

Fifth in a series of articles taking you country by country through South America.

THE transportation problem wasn't solved in Peru for 450 years—until 1920, when along came a daredevil American birdman, Elmer J. Faucett, with what One-Way Corrigan called a "crate." He took on the Peruvian government's standing offer of 10,000 *soles* (a *sol* is worth about 16 cents, U. S. A.) to the first flier who would dare to fly over the Andes to Iquitos, Peru's mining town "over the Big Hill," on the headwaters of the Amazon River. Just to send a half-ounce letter to Iquitos took more than a month: 1,000 miles up the Pacific coast, through the Panama Canal, across the Caribbean Sea, down the South Atlantic around the "Hump" of Brazil, and then 2,000 miles up the Amazon.

Faucett soared over the Andes like a condor, into Iquitos. In a few months, he did something more epoch-making than that. He rigged his plane into a semi-freight car, and began to carry not only passengers, but also heavy machinery, tractors and even cattle on the hoof. Today, you will probably be taking one of the weekly planes of the established Faucett Airline over to Iquitos, as though it wasn't anything at all.

While it is true, that Aviator Faucett opened up air travel via "flying box-cars," he



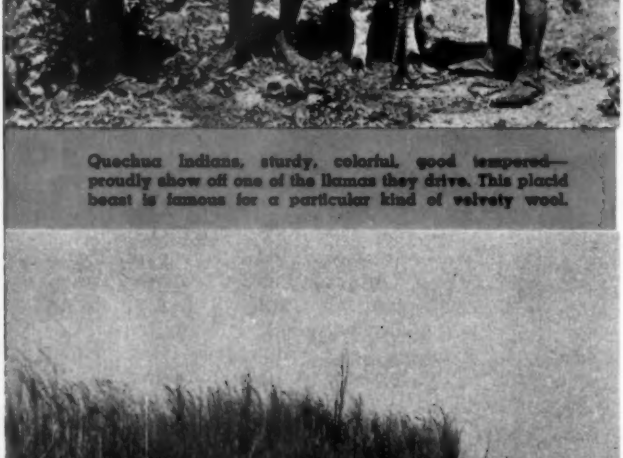
Peru is shoulder-high almost everywhere in the mighty Andes. Modern transportation was impossible as late as 1920. American aviation lent an aluminum wing.

did not solve all of Peru's problems of transportation. A glance at the map of Peru shows you a narrow strip stretching for 1,500 miles along the Pacific Ocean, all the way from Ecuador down to Chile. The coastal plain is for the most part a barren desert, that is sharply lifted up onto the backbone of the Andes, as it begins to move westward. Nearly a million square miles are studded with isolated "islands"—island ports, island towns, island agricultural districts—separated from one another by a vast turbulent sea of deserts, mountains and jungles. Tough going, no matter which way you pick out. There are only a few highways and a couple of stringy railways and a cobweb of donkey-paths. You will have to "go down to the sea in ships," if you want to get to many places.

From almost the first moment you sight the coast of Peru from on board your American Graceliner, you will begin to make discoveries for yourself. You will see an unbroken desert walled in by sky-scraping mountains. Then, just to show you that anything can happen in Peru, you will waken next morning to find the ship riding at anchor in a small bay, with the whole barren countryside sprouting with thousands of oil derricks. This is Talara, where the first oil "strike" was made on the West Coast.

The earliest Spanish settlers made Peru the hub of all their South American empire,

Quechua Indians, sturdy, colorful, good tempered—proudly show off one of the llamas they drive. This placid beast is famous for a particular kind of velvety wool.



It's sugar she wants! At Casagrande, Peru, agriculture runs along sweet enough lines for anybody's future. Sugar cane has but recently been developed—along with other riches.

simply because Indian captives led them to this spot as the center of New World treasure. Pizarro and his company of Conquistadors went through something like Hell-for-Sartin before they actually laid eyes on the gold that had lured them all the way from Panama. Half of his men had perished before he captured the Inca Emperor. For his ransom, Pizarro demanded a roomful of gold and two rooms filled with silver. The gold was valued at $15,000,000. Silver was so plentiful that the Colonists made the most common household utensils of it.

From that point on, the things you hear—and will actually see with your own eyes—in Peru, sound like fairy tales. For example, the sporting thing to do, they will tell you—if you are really hell-bent for treasure—is to go out and find one of the many "lost" gold mines that the Incas camouflaged so that the Spaniards would not get hold of them.

Not so very far from Cuzco, the Inca Capital, in the Madre de Dios region of the southwest, the small rivers drain one of the *potentially* richest gold-producing areas of Peru, if not of all South America. At present, there are some 2,000 prospectors engaged in panning gold along the river gravel bars. The vast region north and east of this extremely high country has never been explored and is inhabited by wild tribes of Indians.

A letter appeared recently in the Engineering and Mining Journal from an American in the Inambari gold mining district. It read: "We have an immeasurable quantity of low-grade ores up this way that could be worked with profit. Lack of transportation is the only thing that has prevented the rapid development of such a rich district. So far, only an occasional 'Gringo' prospector has come here; but all of them have done well. What we need here more than anything else, is men of the type who opened up and operated the mines of Western United States. Men of the pioneer type, who would go into the most isolated places, erect a saw mill and set up a gold mine operation. Such fellows would enrich themselves and develop the country at the same time."

When you go to Lima, where the Conquistadors set up their Capital at sea level, you will find an all-out Spanish city. It is about the last word in comfort and luxury for all that. Hotel Bolivar on Plaza San Martin, the main square, at $5 a day European Plan, is equal to anything you will get at home for $10. The San Martin movie palace across the street rates with the best we can boast. The cafes will make you think of Europe before the war.

There are broad well lighted boulevards as well as cramped streets. The climate is healthful and like perpetual spring.

At the Golf and Country Club you will meet the whole American crew. They are a high-living, hard-drinking, prosperous-looking set of guys. After a second round of drinks you will begin to hear their stories. Nearly all of them seem to have come down to Peru on a shoestring, to hear them tell it. Here's a fellow who had a junior job in the Consular service. He climbed out of the rut to become a contractor. It was he who built the biggest public institution and saved money for everybody, including himself. Another American got his first boost in the offices of the Cerro de Pasco Mining and Development Company. Now he's a Vice President. Or, they will tell you about an American who went out and tried his luck at gold washing in the Peruvian jungle, where some of the rivers literally run with gold. He took with him only a sack of flour and a side of bacon. Today, he comes to town periodically in his own plane from the direction of Madre de Dios, always toting a suit case filled with gold dust!

Here's another one that sounds like a "tall story," but it's true. Every American going down to Peru ought to know about it, if only to show him what unpredictable opportunity lies all over the place.

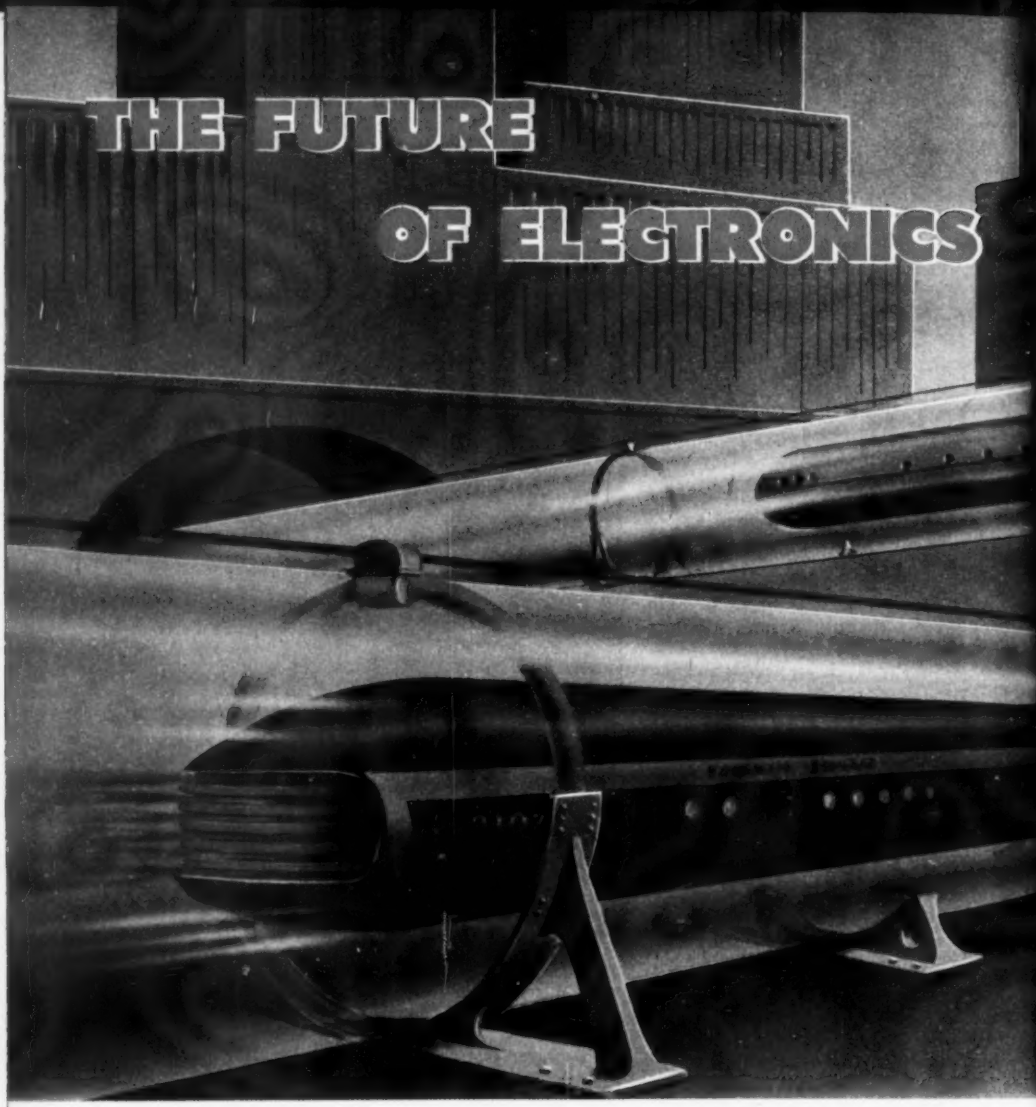
This young man's name is William Vogt, and it will go down in Peruvian history. He was a graduate of the P. W. A., which means that he had never been too much of a success in business. But he knew a whole lot about birds. On that slender thread the government made him Official Keeper of the Birds, which is a big job down in Peru. He had to live alone out on the lonely Guano Islands, that are without water, vegetation or animal life—except for himself and five million birds.

The reason for all this is that the icy Antarctic Ocean pours an undersea stream called the Humboldt Current beneath the warm Pacific. It stirs up the bottom of the sea and tears loose millions of tons of sea creatures called plankton. It all comes to the surface off the shores of Peru. Well, it sets up a free banquet for the entire fish world and they come swimming in by the billion, so thick that you could shovel them aboard ship. But you don't get a chance to, because millions of birds get wind of the fish feast and come flying in from all Four Corners. Now, all these countless visiting birds take up their residence on the nearby islands. The droppings of the birds are called "guano." The Guano Islands are covered with mountains of it giving them the appearance of being covered with a hundred years' snow fall. It makes the most potent fertilizer [*Continued on page* 144]

Llamas again—unperturbed by the precious mining activity in the town of Casapalca. This time it's copper and the tiny village is of enormous importance as a world center today.

You dine al fresco in Indian villages. Roast meat, staple fare of the people, follows the railroad line leading from the coast to Cuzco.

THE FUTURE OF ELECTRONICS

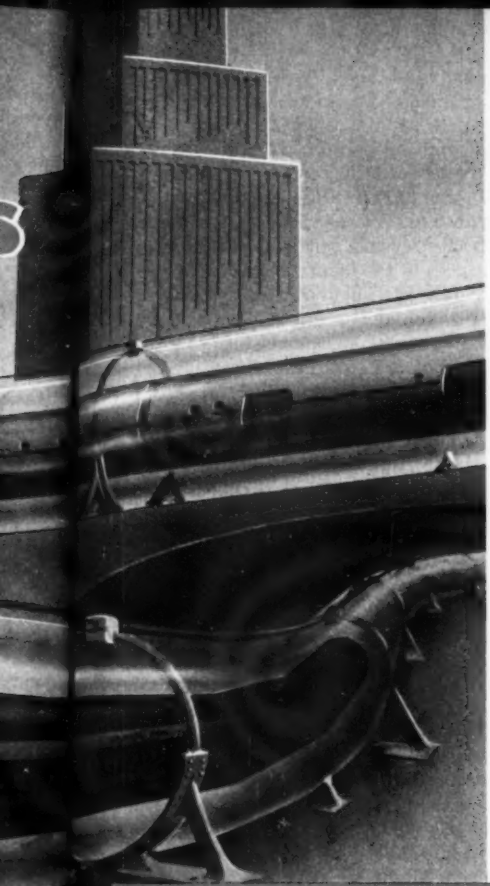


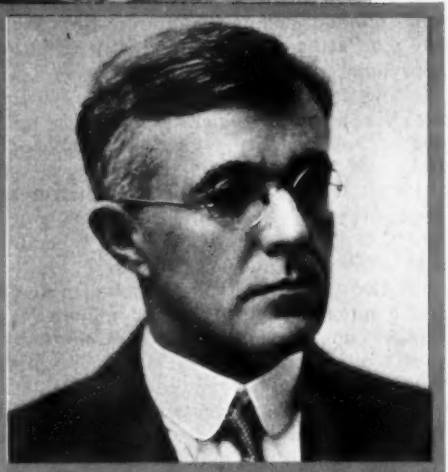
"There is no reason why we could not travel at a speed of 2,000 to 5,000 m.p.h. in a vacuum tube in which air tight vehicles are magnetically suspended in space," says the author. "With such a system, Chicago would be about one-half hour from New York." Artist Fred Ripperda's conception of such an electronic express is shown here.

by Dr. Irving Langmuir

A distinguished General Electric scientist discusses the mysteries of today's most fascinating subject.

WE ARE now on the eve of another great upsurge in progress in the field of electronics. Hundreds of thousands of men in our armed forces have been given technical training with electronic devices. Very great numbers of men from university research laboratories and industrial research laboratories have been carrying on pioneering work in electronics for the war. There has been a tremendous development in industrial equip-





Dr. Irving Langmuir is Associate Director of the General Electric Laboratories, winner of a Nobel Prize for chemistry and one of the world's foremost authorities on electronics.

ment for factories and trained workers who have been building electronic devices for war needs.

It took 20 years from Roentgen's discovery of X-rays to the development of the practical standardized X-ray equipment for the medical profession. Again, it was roughly twenty years from the discovery of the electron in 1897 to the widespread use of electron tubes in the first World War; and another five years before the public received the benefit in the form of radio sets.

The war electronics of today, about which as yet little can be said, if given proper encouragement and support will develop spontaneously into the Electronics of Tomorrow. It may take 10 to 20 years to utilize fully the discoveries that have been made since Pearl Harbor. Rather than make definite predictions it is thus better to think of the possibilities that lie ahead.

Electronics is a branch of Science which deals with devices, and techniques, employing electrons detached from ordinary forms of matter. It is this very freedom of the electron which makes electronics so versatile. It can deal with voltages so minute that a thought or brain wave may initiate an impulse that can be recorded or the electronic device may deal directly with millions of volts. The Betatron, for example, designed by Dr. Kerst, has given electrons with energies corresponding to one hundred million volts.

Electronic devices can be used to control voltages or currents so that they stay unchanged over long periods of time, or other devices correspond to changes that take place in a billionth of a second. Some electronic devices operate with the minute electric currents of the electrocardiograph while others handle many thousands of amperes. An illustration of the application of the large current device is given by the recently built large new plants to make aluminum and magnesium for our airplanes.

In producing these metals direct current is needed which would be obtained from alternating current by rotating machines, called motor generators. Actually 2,500,000 kw. of electronic devices have been used for this purpose and their use has saved for war needs something like forty million pounds of steel and four million pounds of copper which would have been needed to make the motor generators and has saved many months' time in putting the aluminum and magnesium plants into operation.

Electric welding of sheet metal now takes

place very much as cloth is sewed by the sewing machine. If the current is a little too large holes are made in the metal, whereas if the current is too small a tight weld is not produced and leakage occurs. The precise control afforded by the electronic devices gives an enormous improvement and has resulted in the almost universal use of this welding equipment.

If a current at a frequency from 10,000 to 1,000,000 cycles is passed through a coil and a metallic object is placed within the coil heat is generated within the object. If the frequency is low enough the current can be generated all the way through the object including the center. At high frequencies, however, heating occurs only at the surface and it is possible to heat so rapidly that only a thin layer becomes heated. Thus in 2 or 3 seconds a cog wheel can have its surface brought to red heat, then suddenly cooled to produce a thin hard wearing surface while the interior of the teeth still remain tough and strong. That would be impossible by any other known method.

On the other hand, the yolk of an egg can be cooked while keeping the white cold, or even frozen. A modification of the same high frequency coils can be used for heating an inner part of the human body. Such methods have proved very valuable in the treatment of certain diseases.

Our agricultural community now struggles under a tremendous burden in carrying on its task of feeding the human race. Men labor in the hot sun, in scorching winds, or frequently in downpours of rain with tiring, tedious jobs that cannot now be avoided if other men are to escape starvation. Fruit which nature provides bountifully must be gathered by ladder climbing, long reaching workers who must pick each fruit by hand.

I can conceive of an orchard operated entirely without workers in which the fruit bearing trees can be cared for and cultivated and the fruit picked by machines operated and controlled by electronic devices.

An adaptation of the electric eye and the techniques of television should make possible the construction of a machine which will scan the green tree, locate the red or orange colored fruit and direct electrically operated mechanical arms to pick it from the branches, sort it according to size and quality and convey it to containers. The machine could be set to collect only fruit of any desired degree of ripeness.

As long as there is any difference of height or color between useful plants in a field and invading weeds, an electronic device could be designed to make weeding an entirely electrical and mechanical operation.

The inventive mind can and probably will develop the possibilities of transforming farming into an entirely new type of activity in which the physical burdens are lifted from the shoulders of the farm workers.

Let us look at the field of transportation.

Wheeled vehicles seem to have definite speed limits. Higher speeds are attainable in the air, but here too, there are limits set by the speed of sound which restrict propeller driven planes to something like 500 miles per hour.

There is no fundamental reason, however, why we could not travel at a speed of 2,000 to 5,000 miles per hour in a vacuum tube. Such a tube extending from New York to Chicago, or to San Francisco, would be constructed in which air tight vehicles are magnetically suspended in space while moving forward at high speed. The intricate operations would be controlled throughout by electronic devices. It was because of doubts expressed by some of our engineers as to the feasibility of suspending vehicles in vacuum that I devised, with the help of Dr. Tonks of our laboratory, the exhibit of levitation that was shown at the House of Magic at the New York World's Fair.

With such a high speed transportation system Chicago might be moved to a travel distance of about one half hour from New York and the Pacific coast might be only about an hour away from the Atlantic.

Let us take a glance at our cities. From the viewpoint of efficient operation and engineering expediency they are in a chaotic state. Dense automobile traffic operates in them yet every city is a network of dangerous grade crossings—to mention only one problem of conditions within congested communities. We must plan on building our cities on a two level street plan throughout with traffic on any highway never moving except in one direction and with no grade crossings. There are numerous other factors which necessitate the rebuilding of our cities.

The projects I have mentioned are but illustrations of possibilities. It is what people really want that will determine what is best. We must think in terms of converting our vast war production machine to an equally vast peacetime production which will use all present workers and the returned soldiers as well.

THE 4TH ANNUAL MECHANIX ILLUSTRATED

WORD GAME CONTEST!

MORE THAN

$5,000 IN WAR BONDS

100 PRIZES

1st PRIZE	$1,500 In War Bonds
2nd "	$1,000 " " "
3rd "	$ 750 " " "
4th "	$ 500 " " "
5th "	$ 250 " " "
6th "	$ 175 " " "
7th "	$ 125 " " "
8th "	$ 100 " " "
9th "	$ 75 " " "
10th "	$ 50 " " "
11th-25th "	$ 25 " " "

75 PRIZES, 26th to 100th $5.00 IN WAR SAVINGS STAMPS

STILL plenty of time to get in the big "Buildwords" Game if you haven't already started, Contestants! Puzzle No. 1, in case you missed it last month, is reprinted on page 156 of this issue. The game is easy as pie—and more fun than anything of its kind you've ever tried. There's no reason in the world why YOU can't win that First Prize of $1,500 in War Bonds. And if not First Prize, why not one of the 99 others! Remember, straight skill wins this contest; no trick slogans or "runoff" contests. Turn the page and get started right away!

BUY MORE WAR BONDS

61

Here Is The Second Puzzle

CONTEST RULES

1. A different "BUILDWORDS" puzzle will appear in each of the February, March and April issues of MECHANIX ILLUSTRATED. The second puzzle appears on the opposite page. The first puzzle is reprinted on page 156. Contestants will complete each of the three puzzles, striving to attain the highest score possible and printing the score in the proper place marked "TOTAL" on each of the entry blanks, together with the name and address of the contestant. The third entry blank will contain a space marked "GRAND TOTAL" in which the contestant will print the total accumulated in all three puzzles.

2. The individual having the largest correct grand total as printed in the third entry blank will win first prize. The individual having the second largest grand total will win second prize, etc. In the event of a tie for any prize, the individual turning in the neatest, most original and most legible entry will be awarded the higher prize, with the next prize going to the tying entry. However, "fancy" entries will in no case be given preference.

3. Do not send in entry blanks separately. Save your February and March puzzles until you have completed your April puzzle and send in all three blanks together by first class mail, addressing them to "BUILDWORDS EDITOR," MECHANIX ILLUSTRATED, 1501 Broadway, New York (18), N. Y.

4. Contestants may submit legible copies of the first two entry blanks as their official entry if they so desire. The third entry blank must be the one clipped from the April, 1944, issue of MECHANIX ILLUSTRATED.

5. Webster's New International Dictionary, Second Edition, will be considered final authority on acceptance of words used in the puzzles. Words appearing anywhere in this dictionary, as well as forms of those words in accepted usage as constructed under dictionary rules, will be permissible. However, hyphenated words and possessives formed with an apostrophe are not acceptable. Proper nouns and regular plurals, under dictionary definitions, as well as irregular plurals found in the dictionary, are acceptable.

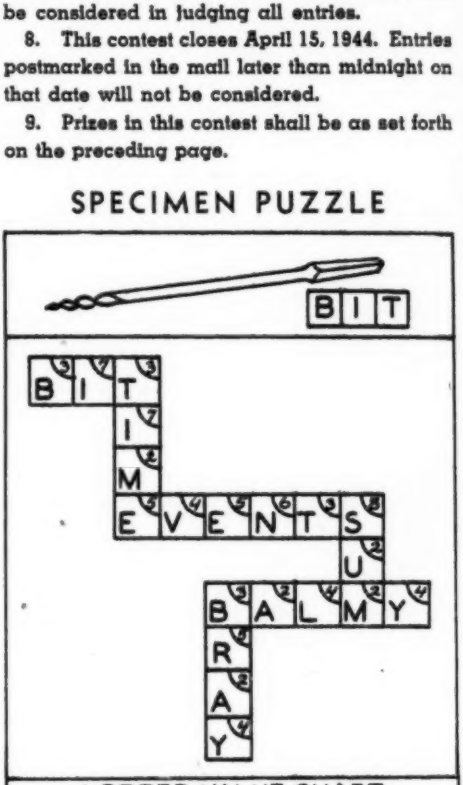
6. No entries will be returned and under no circumstances can we enter into correspondence regarding this contest. Judges will be the Editors of MECHANIX ILLUSTRATED. Their decisions will be final. Anyone in the United States or Canada may compete except employees of Fawcett Publications or members of their families.

7. No contestant may win more than one prize. Neatness, originality and legibility will be considered in judging all entries.

8. This contest closes April 15, 1944. Entries postmarked in the mail later than midnight on that date will not be considered.

9. Prizes in this contest shall be as set forth on the preceding page.

SPECIMEN PUZZLE



LETTER VALUE CHART

A — 2	G — 6	M — 2	T — 3
B — 3	H — 2	N — 6	U — 2
C — 4	I — 7	O — 3	V — 4
D — 8	J — 1	P — 7	W — 1
E — 5	K — 3	Q — 1	X — 6
F — 1	L — 4	R — 5	Y — 4
		S — 8	Z — 5

MY HIGH SCORE IS 81

In The MI PRIZE CONTEST

HOW TO DO "BUILDWORDS"

"BUILDWORDS" is as easy as rolling off a log. Just look at the specimen "BUILDWORDS" on the opposite page. It has been filled out for your guidance.

FIRST: You will notice that the first thing we did on the specimen puzzle was to identify the tool shown in the picture at the top. It's a BIT, of course.

SECOND: We found a three-letter space among the squares below. You will note we put the word in the top three squares. We might just as well have put it in the other three-letter square group where you now find the word SUM. Puzzle No. 1 has a five-letter key word.

THIRD: Fill in the other rows of interlocking squares, using the "T" in BIT as a jumping off place. Use only accepted dictionary words, as explained in the rules. Each letter has a different numerical value, given in the chart below the specimen puzzle. The letters "S" and "D" have the highest value, as you will note, so you obviously should try to get in as many words with "Ss" and "Ds" in them as possible, to bring up your score. Place the numerical value of each letter in the corner of the square. All words must read from top to bottom or from left to right.

FOURTH: After you have fitted words into all of the interlocking squares, as demonstrated in the specimen, add together the values of all the letters and print your total score in the space provided for it at the bottom.

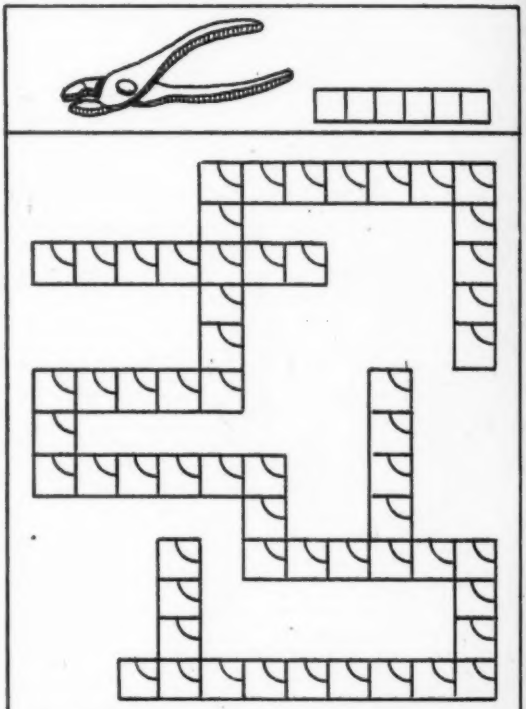
FINALLY: READ THE RULES CAREFULLY AND FOLLOW THEM PRECISELY!

CONTESTANTS

Would you like to have a chance to win a cash prize, as well as one of the regular contest prizes, shown on page 61? If you would, turn to page 142 and see how you can win a Cash Sponsorship prize, merely by telling your friends about MECHANIX ILLUSTRATED'S great "Buildwords" contest!

PUZZLE NO. 2

(PUZZLE NO. 1 REPRINTED ON PAGE 156)



LETTER VALUE CHART

A — 2	G — 6	M — 2	T — 3
B — 3	H — 2	N — 6	U — 2
C — 4	I — 7	O — 3	V — 4
D — 8	J — 1	P — 7	W — 1
E — 5	K — 3	Q — 1	X — 6
F — 1	L — 4	R — 5	Y — 4
		S — 8	Z — 5

MY HIGH SCORE IS

NAME .....

ADDRESS .....

CITY..... STATE.....

If you were sponsored in this contest fill out the following. If not, leave these spaces blank.

SPONSOR'S NAME.....

ADDRESS .....

CITY..... STATE.....

Save this puzzle and Puzzle No. 1, appearing in the February issue of MECHANIX ILLUSTRATED, until you have Completed Puzzle No. 3 appearing in the April issue of MECHANIX ILLUSTRATED. Send all three completed puzzles in together.

FROM HAWK TO

by

Major Joseph J. Kruzel, U.S.A.A.F.

as told to

Beryl D. Kneen

This is part II of the air exploits of Maj. Kruzel who won the Purple Heart and the Silver Star with two oak leaf clusters over the Philippines and Java in a P-40. He is now pilot of a P-47 and is "on his way back in the Pacific." Part I appeared in Feb. MECHANIX ILLUSTRATED.

LORD knows, there were few enough of us veterans of the air war over the Philippines left. And the odds against us in the Java skies had thinned our ranks to the desperate stage. With our commanding officer, Major Sprague, missing, Captain Mahoney assumed command of our squadron in our fight against the increasing swarms of Japs.

Successes were few for us. Lieutenants Hines and Hoskyns were shot down over Soerabaja the day after we saw Major Sprague go into his last run.

We went into the air nearly every day and, while we continued to shoot down both bombers and Zeros, we knew our time on Java was drawing toward a close. We were hopelessly outnumbered, exhausted and our planes needed overhauling. Captain Mahoney was called away on an inspection trip with General Brereton and during his absence Lieutenant McCallum took command. McCallum, however, lost his life the day after he took over, when three flights took the air on February 25th to meet 54 Japanese bombers accompanied by about 36 Zeros. The Zeros dove on A and B flights from about 26,000 feet and, in the ensuing battle, flight C was able to dive on the attacking Zeros, since all had dropped somewhat in elevation. C flight got about three Zeros, but Lieutenant McCallum in Flight A, which had been forced to drop away from the Zeros, had to bail out, and the Japanese machine-gunned him as he descended by parachute. Everyone else returned.

The squadrons went up again the next day in the morning, and found enemy fighters and bombers flying at 27,000 to 30,000 feet above Soerabaja. The squadron was unable to get above 26,000 feet and hence was unable to attack. The fleet of Jap planes sailed on over our heads and we had to return to base cursing bitterly. The only scrap that day was one that Hennon managed to find. He came across two Zeros flying low, probably on their way to their field in Bali. He went in after them and got one.

On this same day six Brewster Buffaloes and six Hurricanes, all with Dutch pilots, joined us. The Hurricanes were out of commission until the first of March, because they had no hydraulic fluid and ammunition. The squadron itself had 17 planes, with 12 in commission. The odds against which we were working and the comparatively small scale of our operations was shown by the excursion of February 27th, in which I went out as one member of two flights to escort three A-24's, which had been ordered to bomb a Jap convoy headed toward Java and were reported to be about 90 miles at sea. When we reached the convoy we had a look at a good-sized naval battle for the first time, for Japanese and Allied fleets were in the midst of a heavy scrap. There were about 45 Japanese transports and warships headed toward Java when they were intercepted by the Allied fleet. The A-24's sank one 14,000 ton transport. We saw one of their cruisers sinking as a result of the action and one of our cruisers in tow. The incoming Japanese fleet had no fighter protection, as most fleets would have today, though we had expected to find carrier-based planes with them.

The next day we were called up twice, without finding the reported enemy the first time and with no luck the second, for a flight of bombers and Zeros sailed on over our heads and we could not get up to them. Four of the Brewsters flew with us and they were attacked by nine Zeros and had to dive away, being unable to get above the Japs. One Brew-

THUNDERBOLT

ster's motor failed and the pilot had to jump.

We were down to 13 ships now with 12 in commission and many P-40's were having to turn back from missions because of motor trouble. They had all flown about 150 hours of combat with little or no maintenance. The ships had to remain on the alert all day and the engines could not be taken down and worked on.

After this attempt we were ordered to plan a raid at dawn to strafe the Japanese invasion fleet which had established a beachhead at Rembang. All the P-40's that could fly, four Brewsters and six Hurricanes were to attack on the morning of March 1st. It was our last flight, but we did not know that. During this period our American bomber liaison officer, Frank Kurtz, had been working to get us out of Java. The Dutch had given him permission for us to leave after performance of this last mission. We had gone out before he reached us, so we did not know we were coming back, if we came back, to leave Java.

We set out with three flights of three P-40's each, flying in string with the Hurricanes second and the Brewsters last. The men who went out were as follows: A flight, Lts. Kiser, Adkins, R. S. Johnson; B flight, Lts. John

The first heavy bomb to go out of England under a Thunderbolt. If this ship, its fire power, its speed, its ability to land had fought the Japs over the Philippines and Java—there'd be a different tale to tell. Our P-40s, mainly low altitude fighters and too few of them, did what they could in the Pacific then.

Some of those brave Dutch flyers got away from Jap-conquered Java. Here they fraternize with British and Aussie personnel in Australia.

Dale, Caldwell, McWherter; C flight, Lts. Kruzel, Reagan, Fuchs.

During the night the Japanese had landed their main force on Java shores, but they were still busy bringing in materiel and troops in small boats when we showed up. If we had been in large force they would have been very vulnerable to attack. About 30 transports were anchored off the coast and barges were plying between the shore and the ships. The Japanese were not caught off-guard however. Both shore batteries and anti-aircraft guns on the vessels opened up as soon as we appeared. All of our planes were caught in this intense criss-cross fire between shore and sea. The AA fire was terrific and Caldwell, Reagan and Adkins were shot down. Caldwell was seen to crash into the sea and Reagan was last seen attempting to land with his ship on fire. Lee Adkins bailed out from a low altitude and landed about 300 yards from the Japanese position. Though it might be expected that we would never see him again, he escaped and joined the squadron at the port from which we flew at the end.

We kept on strafing the Japanese in spite of the fire and sunk many barges and small boats filled with troops and supplies. We were also able to stop the sky-typing of a number of anti-aircraft batteries. The barges were the best target we could want, for they were strung out seven or eight deep in column. We made passes at them out of the sun and had the satisfaction of knowing that we did considerable damage.

During this mission my engine sustained a direct hit from a large calibre shell. I don't know why it didn't quit, but I was able to nurse it along and continue to attack through the screen of anti-aircraft bullets. I strafed the beach batteries and the barges as long as my ammunition lasted and then pushed what was left of my plane back through the air to its base. Our flight came back with as much dash as we could show, but we didn't feel very snappy, since all of our planes were pretty well riddled and weren't up to the aerobatics that we usually performed when we came back to base. We came in one at a time as our ammunition gave out and as our planes were able. None was in good shape.

At the field, Kurtz, the bomber liaison officer was waiting for us. We were to get out and go to Jogjakarta. From there we were to be flown out by bombers. He arranged to turn over to the Dutch what we had left, but just as we were leaving the field, the Japanese found it at last and came in and strafed the poor P-40's we were turning over in our last attempt to help the Dutch. If we had stayed we would have had nothing to fly in. All the planes were burned or damaged. Our work was done in Java.

We felt badly leaving behind the Dutch pilots with whom we had been flying. Kurtz offered to fly the Dutch out with us, so they too could plan on coming back. They refused to leave. But Captain Kurtz did arrange that, if we could come back in a bomber, we would circle the Malang field for a signal, and if possible would pick up their fighter pilots. I understand the trip was made, but there was no signal, so we do not know what happened to many Java Dutch who flew and fought with us in their old Buffaloes and Hurricanes.

We got to Jogjakarta in a truck, dead tired, after a rough ride during which we were lost several times. A couple of the B-17's were burned in a Jap attack on the field while we struggled across Java. But we were flown out to Australia in one that survived, and after a six-hour flight we landed at Broome, safe for the time being.

During our Java tour we had fought over territory from [*Continued on page* 155]

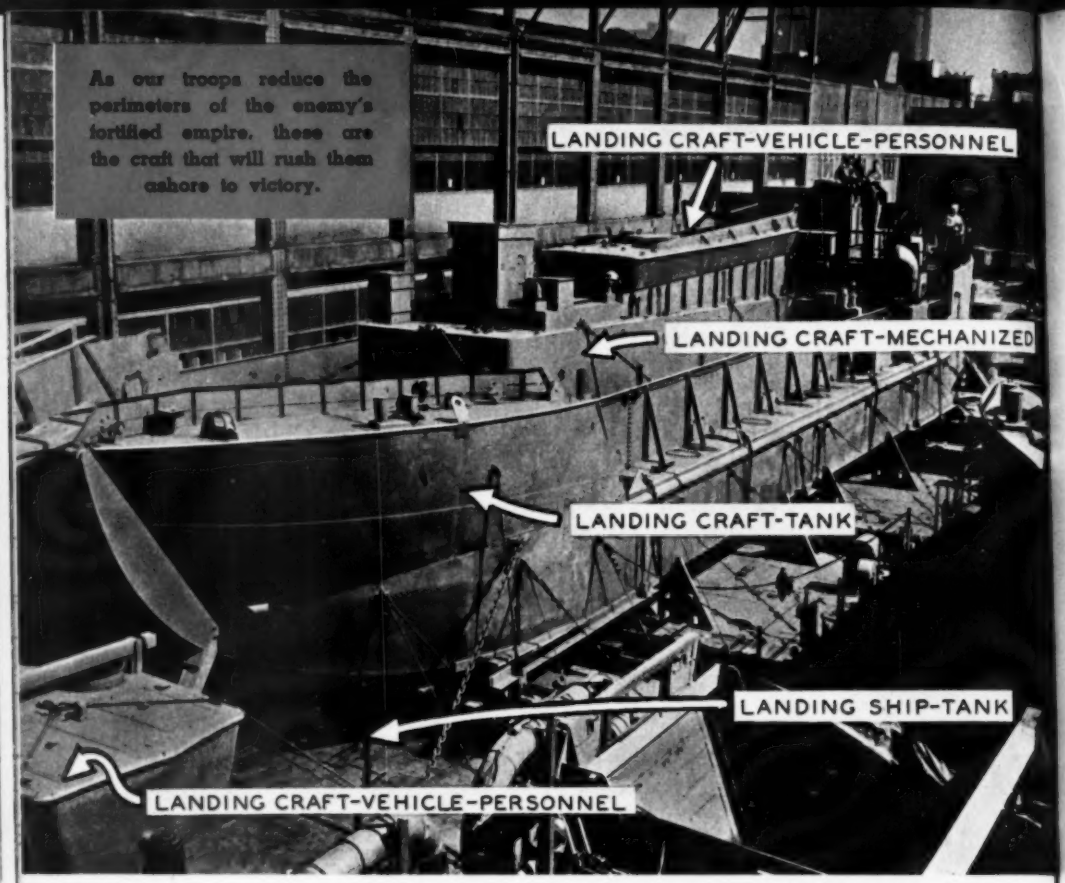
NAZI ROCKET GUN

ONE of the most highly publicized of so-called Nazi secret weapons has been the threat of the use of great rockets with vast explosive power and tremendous range. One version is of a machine to catapult nitric acid rockets across the English Channel. These "killers" supposedly destroy life over an area of twenty square miles. Here are pictures of smaller German rockets, their carriers and the men trained to fire them.

Rocket bombs are in frames ready for firing. A gunner rests at the sights, awaiting the order to fire. This is said to be one of the latest German rocket guns.

The first of the six rockets leaves the frames. Advantage of weapon—it picks up velocity in the air. Disadvantages—inaccuracy, duds, loading waste of shells.

The gun crew rushes forward to reload one of the carriers, all six missiles have been fired. In left foreground is another of the hysterically publicized guns waiting for reloading. Or have they both fizzled, Nazi style?


As our troops reduce the perimeters of the enemy's fortified empire, these are the craft that will rush them ashore to victory.
LANDING CRAFT-VEHICLE-PERSONNEL
LANDING CRAFT-MECHANIZED
LANDING CRAFT-TANK
LANDING SHIP-TANK
LANDING CRAFT-VEHICLE-PERSONNEL

The ultimate in space-saving is achieved by nestling this war's landing craft on the deck of a landing ship for tanks, the big fellow that has the hinged jaws on the front and can carry its own ramp for landings. These are official U. S. Navy photographs.

LANDING—ON THE ENEMY

by Beryl D. Kneen

THE scene is a rocky beach—it can be anywhere in the world. Maybe it is one of the places that have coral reefs in front of it. Or perhaps it has one low valley opening on the shore and a collection of cliffs. The Army has to get ashore and it is the first war in which we have had to go ashore as a regular procedure where there are no good wharves ready for troops and equipment.

Because we have to go ashore in all sorts of impossible places, the whole science of landing craft construction and amphibious warfare has been developed.

At any rate here is a beach. Offshore, out of range of the enemy guns, lies a great collection of large landing craft, transports, destroyers, cruisers and aircraft carriers. A screen of dive bombers and fighter planes rises up for attack and interception. Under its cover, the small landing craft, chiefly Higgins boats, swing over the side. Coast Guard, Navy crews or Army men operate them. Troops swarm down landing nets into these 36-foot motor craft with ramp bows. These small boats and the big landing craft carrying tanks, trucks, guns and miscellaneous equipment begin to circle about in a rendezvous area. The transports and cargo ships have been loaded in the United States, so that the first things needed ashore are on

top and they come out of the hold in that order and swing into the craft that will ferry them in. The process is a long and complicated one—often done under fire.

It may have been preceded by operations of the Navy Beach Battalions which approached the selected beach under darkness and placed markers, to give the following vessels the depth, direction of the beach and distance from it. These battalions use a boat about the size of the Higgins landing barge, equipped with sounding apparatus. On the beach itself, if the enemy is not placed directly on it, the party can lay out strips of colored cloth about ten feet long, like a banner across a street, to give further directions to the landing parties. Such a system was used in the attack on Salerno.

Methods continually change. The landings originally were made under a naval barrage. They still are, but now small boats armed with rocket guns of the bazooka type race along with personnel boats. They take over the protection of the landing forces when the barrage has to lift to keep from hitting the boats. They also help in exploding mines which enemy forces bury along beaches and under water to hamper landing forces.

The minesweeper may precede everybody

The joint U. S.-Canadian force which took Kiska in Alaska was of overwhelming strength. Landing barges come ashore in pairs on the barren, craggy seacoast.

The yawning bow doors of two LSTs that have disgorged cargoes of men and machines onto Kiska —the amphibians' most revolutionary contrivance.

Toward Espiritu Santo Island, in the Hebrides, a landing barge chugs with a truck and a tractor.

Perfect equilibrium is maintained while lowering a tank lighter from a ship off North Carolina coast.

In camouflaged amphibious tractors Marines approach land from landing barges in the Pacific.

A "duck" brings a slingload of supplies ashore where a truck's crane hoists it to a waiting truck. Leaving supplies in sling saves time.

An amphibious jeep has a trailer. A waterproofing compound is applied to this type of equipment, then the crew pushes it ashore.

An inflated raft takes a 37mm gun and a one fourth-ton truck across a river. These rubber boats can be rowed or driven by outboards.

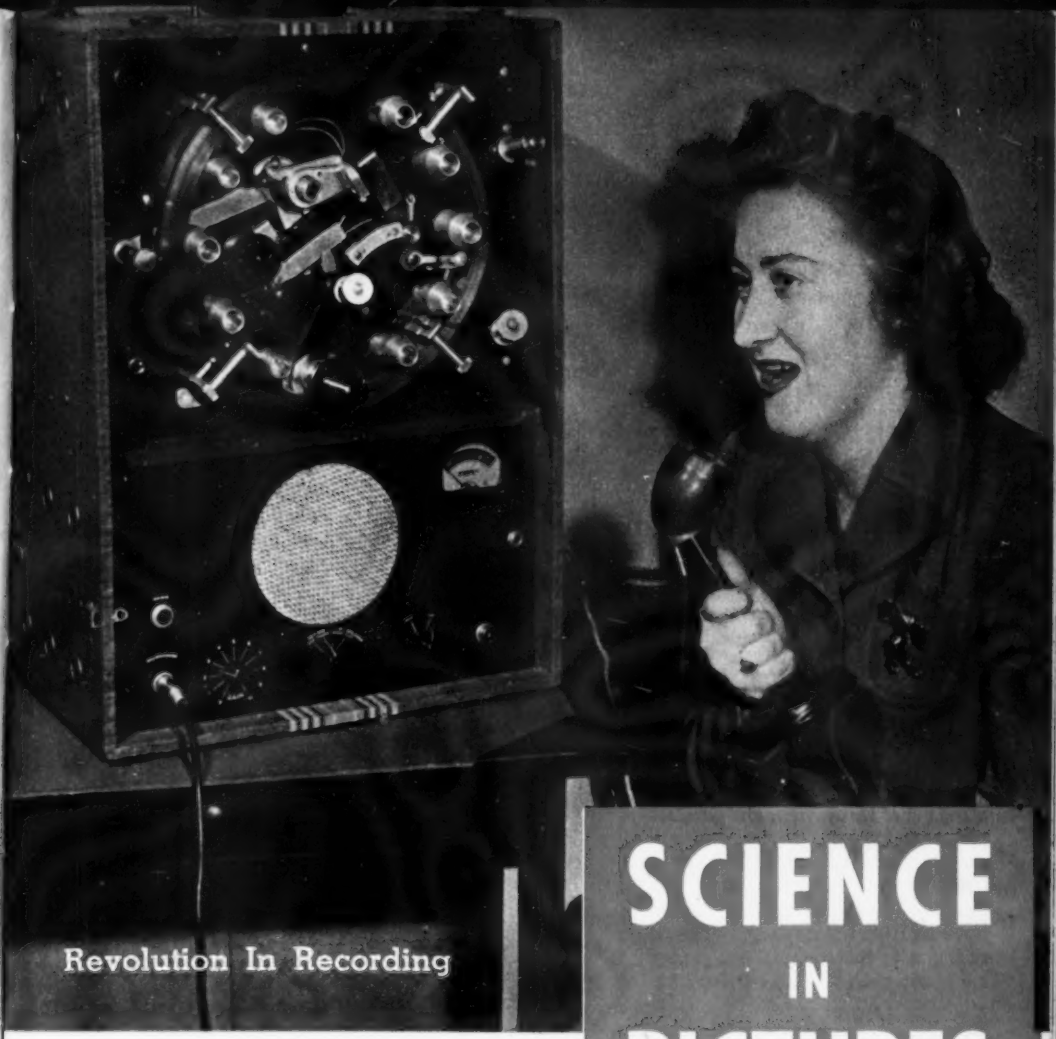
in the operation and clear the water of all the mines it can reach. Those in shallow water and on shore have to be exploded by fire or prodded for. The Germans, pushed by lack of material, now lay a more dangerous mine than ever. The magnetic and electrical mine detectors can't locate it. It is often just cement poured in the sand with a charge and detonator. Plastics replace metal and thus have no magnetic field.

With the small rocket boats, come the small personnel boats. Bullets whistle by them. Mortar shells land heavily on them. Most of them get ashore, but there are always some losses. Some of the wire barriers have been cut by artillery fire and the blasts from the rocket boats. Other entanglements have to be cut and the troops take shelter and hang on. If they hang on, the rest of the landing party comes in. Tanks and artillery, demolition parties, beach control and communication parties follow. The beach is prepared for the landing of heavy artillery, large motorized pieces and supplies. Wire mesh roads are laid across the sand to support heavy guns and the Signal Corps sets up the communications system.

If the landing party can't hang on, it has to be evacuated by the same small landing craft (LCP). One of our Congressional Medals of Honor went posthumously to Douglas A. Munro, signalman first class of the Coast Guard, who was killed while holding his small boats against the shore to protect the Marines that were being evacuated from a tight spot. Realizing that the last men off were in the position of greatest danger, he held his landing craft as cover against the enemy fire until all were aboard, returning Japanese fire with bullets from his own craft.

It is difficult for the layman to decide whether the most ingenious of the landing craft are the big landing ships for tanks, with their great doors that open up for large pieces of motorized equipment to pour out or the landing craft for infantry, with their ramps down the side for the men to come down and rush out over the beaches, or the amphibians (the Marine Corps alligators and buffalos and the Army ducks) which chug ashore through the waves with cargo or men running as far inland as desired to unload.

They are a longshoreman's outfit plus dock handlers and truck drivers, rolled into one small craft. Twenty-five ducks, who got their appropriate name from the manufacturer's designation DUKW, splashing around a heavily laden [*Continued on page* 138]



Revolution In Recording

SCIENCE IN PICTURES

THE device shown above threatens to revolutionize present ideas about phonograph recordings, according to its inventor, Jay Fonda, a movie sound engineer. It is an instrument which records sound on a strip of cellophane four inches wide and as long as desired. The sound is recorded on the cellophane by means of a needle, in much the same manner that sound is recorded on ordinary, present-day disks—but the needle travels so lightly that scratch is almost completely eliminated, Fonda claims. The principal value of this method, however, is that one strip of cellophane will record a whole series of symphonies, and 24 hours of music can be played from it without "changing records."

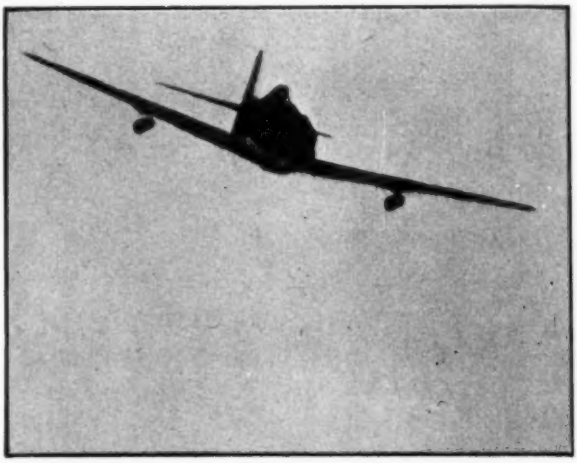
Fonda claims his system will make possible much cheaper canned music in the home and asserts, too, that his device can be produced to sell for approximately $50. The instrument will handle home recordings as well as commercial music. Think of the possibilities connected with having records of certain phone confabs, Junior's first speech, etc. Unlike another radical system of recording, magnetizing steel wire as thin as a human hair (see Dec. M. I.), this unit cannot be magnetically affected.

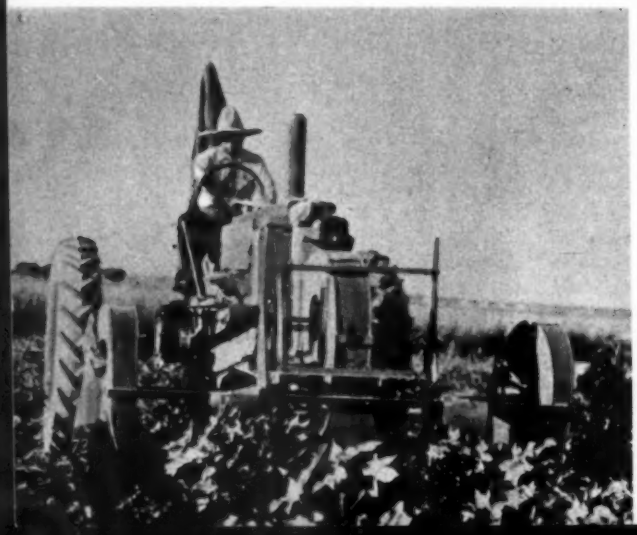
China's Telegraph Of Tomorrow

TO SPEED communication between the principal cities of our oriental Ally, Western Union is sending Telefax machines. Heretofore telegraphing in China was complicated by the thousands of characters in that language, more than 9,000. Telefax telegrams are electrically transmitted, arrive at their destinations as facsimiles of the sent messages, no matter what the language. The instruments are redesigned to facilitate Signal Corps installation.

That Rocket-Firing Winged Enemy

WE'VE been hearing a lot about the Nazi use of land and airplane rockets. Here's a picture taken from an American P-47 Thunderbolt of the German FW-190 rocket shooting-plane. It is said that this armament permits planes to stay out of range of our .50 cal. machine guns where rocket fire power is still able to shoot our airships down. But our flyers have learned the devastating trick of firing at the rockets, one under each wing, and not at the plane.





Ol' Bug Blaster On A Tractor

TEXAS cotton has been the first to benefit by the use of a 250-lb. device that can be attached to any make of tractor. A. R. Nisbet, retired cotton planter of Plainview, Texas, invented the two-row insect catcher. A large fan propelled by the tractor's motor tunnels blows air upward through two pipes to strike insects on under sides of leaves. Units are $275 apiece.

LIGHTER MOMENTS with fresh Eveready Batteries

"Fox, old boy, looks as if you'll have to find yourself a manhole!"

ALMOST our entire production of "Eveready" flashlight batteries is going either to the armed forces or to essential war industries. So please don't blame your dealer for being out of stock.

Before you buy anything else, be sure you've bought all the War Bonds and Stamps you can afford.

FRESH BATTERIES LAST LONGER... Look for the date line →

EVEREADY
TRADE-MARK

The word "Eveready" is a registered trade-mark of National Carbon Company, Inc.

Where The Dining Car Comes To You

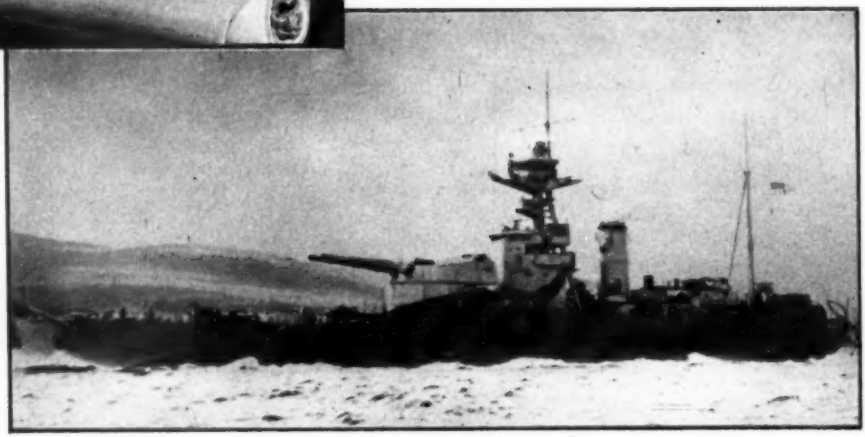
BILL BROOKS of Royal Oak, Mich., is owner-manager-head waiter of his unique and novel eaterie. His silent waiter is a model train that sneaks out of the kitchen, hauling sandwiches around the counter before delighted customers. Mr. Brooks, an individualist and a firm one, will not be hurried by impatient guests, will not employ a helper. He says he's through with headaches and bosses ordering him around.

Plastic Screens Now

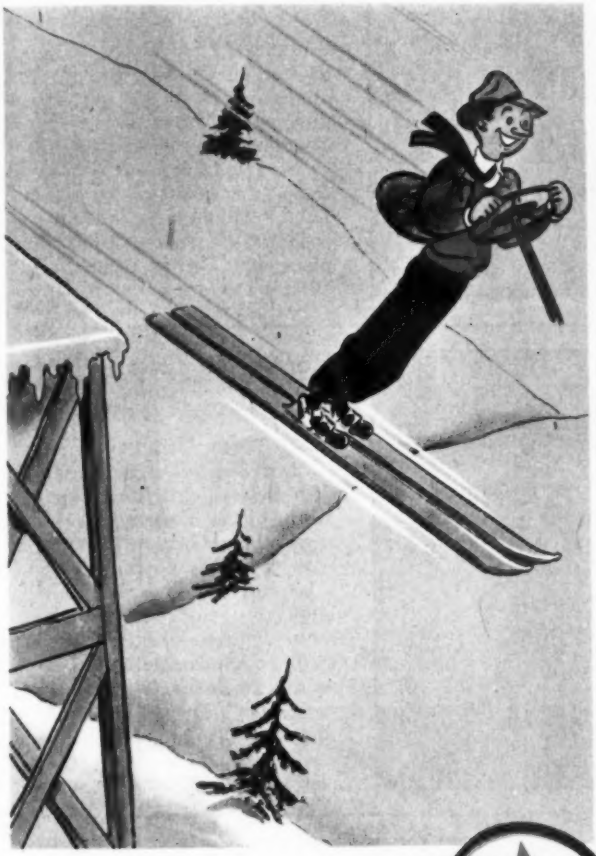
AT THE left is another use of plastics, this time it's Velon made by Firestone, that will give the harassed home owner a break. The familiar wire screens were always a nuisance to patch, were ugly when they were. This revolutionary new screen can be stabbed with a pencil and lo!—there is no hole.

Monitor

THE Roberts, HMS, one of the British monitors that have played a blasting part in the Allied drive in the Mediterranean, cruises by. These vessels were specially designed to attack land objectives. Their forte is knocking out enemy batteries, smashing rail and road communications.



Here's how your car FEELS...



... after

MARFAK

chassis lubrication!

Car stiff in the joints? Hard to handle? A rattle here, a squeak there? Give it new riding comfort and driving ease with tough, long-wearing MARFAK chassis lubricant. Always applied by chart, never by chance. From king pins to rear shackles every point of lubrication is shown on the chart and the proper type of lubricant is plainly listed. And with each job your Texaco Dealer checks every point of wear, every point of adjustment, sends your car forth hale and hearty. Ask him to give your car that "MARFAK feeling"—tomorrow!

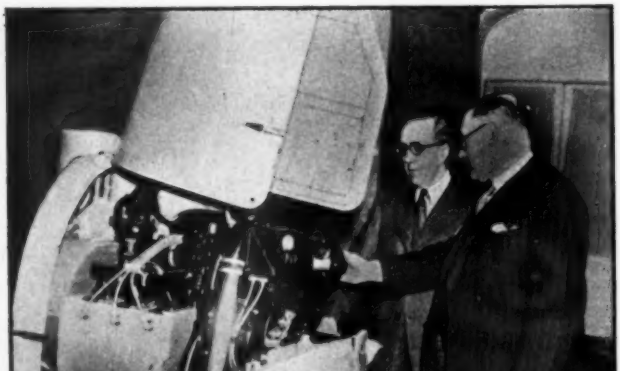
For Your Enjoyment... 2 Great Radio Programs

FRED ALLEN: Every Sunday night. See your local newspaper for time and station.

METROPOLITAN OPERA: Complete broadcasts of great operas every Saturday afternoon. See your local newspaper for time and station.

"Long Tom" Gets Around Fast Now

THE 155 mm. gun, known to cannoneers as "Long Tom," won't be late for work with this speedy prime mover, the latest thing in Army tractors. Known as the M-4, this armored machine, even with its antiaircraft gun, is roomy enough to carry an 11-man gun crew and plenty of ammunition. Easier to handle than a truck, it's a driver's delight. This one's "hitting the road" at the Field Artillery Replacement Center at Fort Sill, Okla.

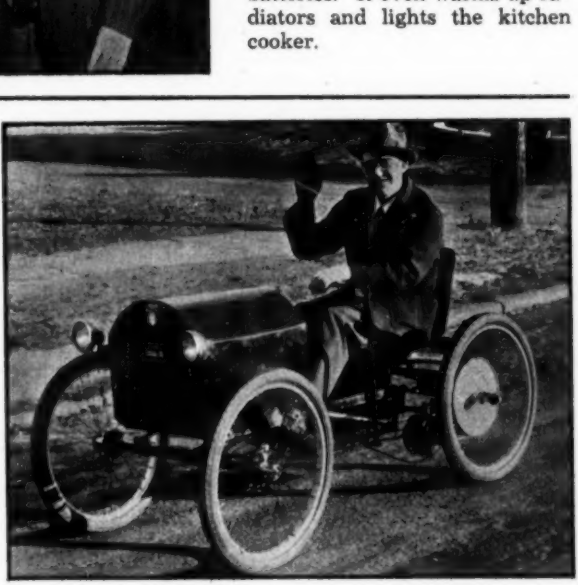


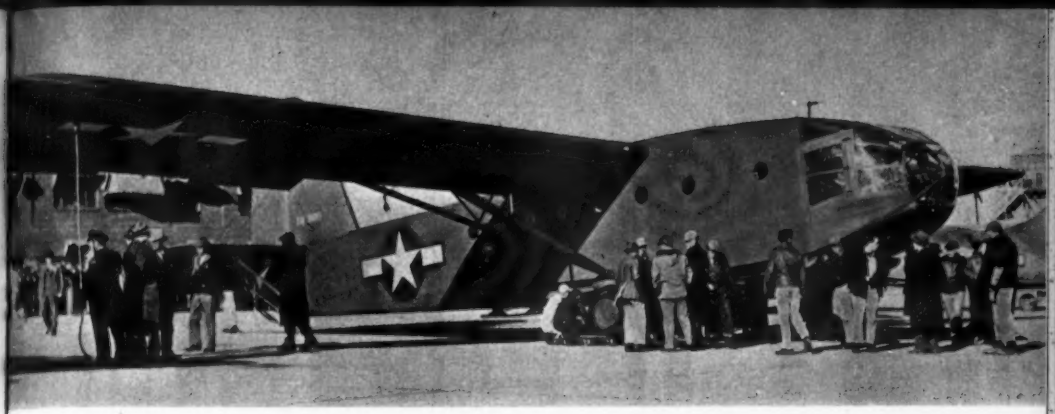
Here's An Engine That Even Cooks

THIS compactly boxed unit is a flying powerhouse—the fifth aero-engine that supplies all the power in our newest four-engined bombers. No bigger than your automobile engine, this potent little station pumps out current that starts the craft's main engines, operates the instruments, turns the gun turrets, works the radio, and recharges batteries. It even warms up radiators and lights the kitchen cooker.

No Gas? No Matter

JOSEPH JACOBS is one man who'll never fume over the gas shortage. Superintendent of a Minneapolis electric company, he built this electric car in his spare time. Powered by three 12-volt storage batteries and driven by two motors, the machine will keep plugging for 100 miles without recharging. Top speed of this overgrown scooter is 15 miles per hour, but Mr. Jacobs hasn't been late at the office yet.





Gargantuan Glider

THE Army wants 'em huge and it wants a lot of 'em. Here is the first of many to be built by Northwestern Aeronautical Corp., after its official tests at Wold-Chamberlain Airport, Minneapolis, Minn. The glider, known as the WCG-13, is the largest ship of its type ever built for the Army Air Forces. Compare with British Horsa Glider, Feb. MI.

British Barrel Bunking

IT'S wet in Italy and there are miles upon miles of mud. These two British veterans of the 8th Army are accustomed to using what is at hand for comfort and protection. They found two of those enormous Italian wine barrels, storers of chianti, and converted them into a more or less comfortable billet. The tarpaulin overhead keeps their night light in and the winter rain and cold out. Here, in the thin sunshine of one clear day at the Termoli front, they do what they can to dry out. Note the tarpaulin's handy draw string, the rifle at hand's reach, the cook stove within one step distance, the condition of their shoes, the rocks that hold the barrels.

Freedom's Rising Sun

THERE is irony in the resemblance which the steel work here pictured bears to the rising sun—but definitely. The land that flaunts that emblem can't stand too many of these structures popping up nearer and nearer. It's an interior view of a prefabricated, bolted steel storage tank, being erected by the 7th U. S. Naval Construction Battalion on remote Island X.

PLASTICS

THE GREAT *New* FIELD OF OPPORTUNITY

PLASTICS ENGINEERS AND TECHNICIANS NEEDED IN NOT ONE BUT MANY CLASSES OF INDUSTRY

● Leaders in science and industry have long been saying, "Keep your eye on Plastics." But now the time for action has arrived. The future of huge possibilities has already begun. Developments in Plastics for hundreds of wartime uses have set the pace for revolutionary changes in peacetime production of thousands of products.

THIS IS YOUR BIG CHANCE

Today there's a big need in vital war production for those who are trained in Plastics. From one to a hundred articles made of Plastics must be supplied for every man in our fighting forces. Start training now in Plastics Engineering, in spare time in your own home. Fit yourself for a responsible, well-paid position. Help to win Victory. And at the same time you will be preparing for even greater opportunities when the war is over.

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The Galloping Ghost Takes To The Air

BY SHEER artful dodging this Taylorcraft observation plane is outwitting the fastest German fighters in Europe. Its high wing construction enables it to take off in 65 yards, climb at 1,000 feet a minute and change direction like a winging butterfly. Used for artillery spotting, the plane is shown here "jumping" an automobile.

It Tells Where You Are When You Shoot

THE new Zenith camera, a three-unit device shown at left, enables an aerial photographer to determine the exact longitude and latitude of each mapping shot taken over a war zone. Produced by Eastman, the camera photographs an enemy installation and so marks the print that bombers may then return to the exact spot. Precision bombing wipes out enemy vital points without guesswork.

The Lowly "Kicker" Becomes A Bridge

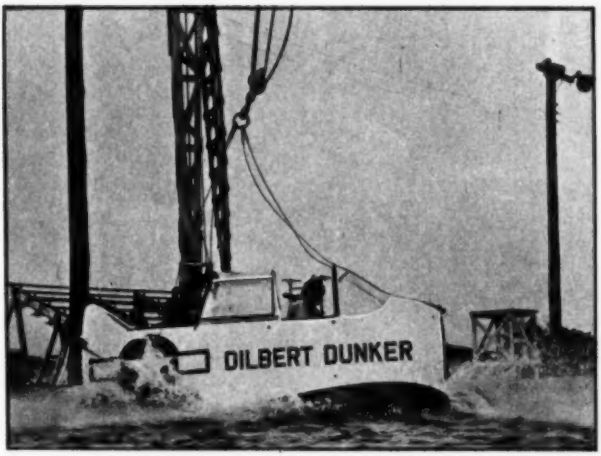
IF YOU'VE wondered what has become of the outboard motor you used to use on a fishing trip, here it is! The kicker, in warfare, is attached to two folding boats which are connected together by a light steel framework. On the frame a platform rests. On the platform, army vehicles weighing as much as five tons can be transported.

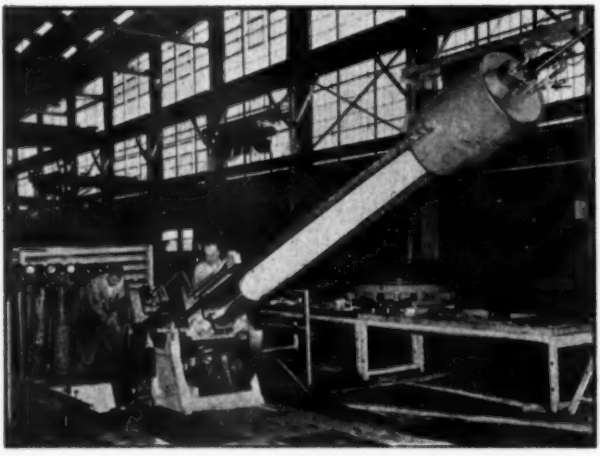
"Lightning" Goes Naked

THE "Lightning," famous P-38 fighter plane, has been stripped for action. Until recently this fork-tailed craft was covered with camouflage war paint, but from now on it will be an unadorned streak of silver, the natural color of aluminum. This denuding has already saved thousands of production man-hours and cut down the plane's skin friction in flight. The only coatings now used are anti-glare patches.

How About It, Emily Post?

DUNKING has suddenly come into its own with a vengeance at the Navy's Air Training Center in Corpus Christi, Tex. Flying cadets are unceremoniously dumped in "the drink" by this dunker, a sawed-off two-seater plane, to teach them how to handle themselves in case of a real crash. Fully clothed trainees have to scramble out, then blow up and climb aboard the bobbing rubber boat.





Big Gun Fired Without Shells

HERE'S one time a big 5-inch naval gun will never hurt you,—when it's being test-fired at the Fisher Body Pontiac Division of General Motors. In order to dispense with firing ranges and simplify testing procedure, Fisher engineers have worked out a way of simulating all the conditions resulting from an actual discharge. It's all done with compressed air, works so well that all firing phenomena can be studied as though they were the real thing.

Horse Collaring An Engine

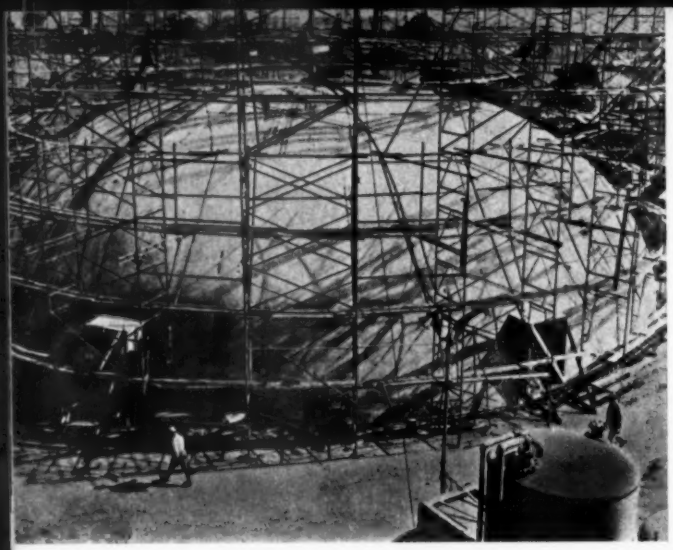
A "HORSE COLLAR" for the rarefied atmosphere of high altitudes gets hung over the nose of a 2,000-horsepower airplane engine mock-up. It's actually a part of a new General Electric Co. ignition system. Heretofore, ordinary systems of ignition were apt to break down "away up there." High-voltage current escaped into the air or sparked over to the engine. Use of the new system assures the pilot that all of the high-voltage current is being delivered to the spark plugs. Haven't you watched the old "Chevie" light herself up in cold weather?

Your Change, Madam

ONCE in Sweden you might have bought some herring and been given this Eight-Daler, 32-pound piece of plate money, in change. If those stamps were not impressed in it to make it legal, it might be a metal flagstone or a grave marker. One of the World's largest coins, it is here contrasted with an Indian coin (inside small box). The New York Numismatic Exposition exhibited it.

New Navy Dress—Gray-Green

THE Navy shows its new battle suits and an inflated raft that goes with Battle Suit No. 4, left hand figure in the picture. These suits protect men from small fragments and splinters of shells and bombs, flash burns and underwater explosions—as well as from drowning. The dress weighs under four pounds and is made of gray-green poplin. They look a lot like a Cap. Marvel take-off suit.

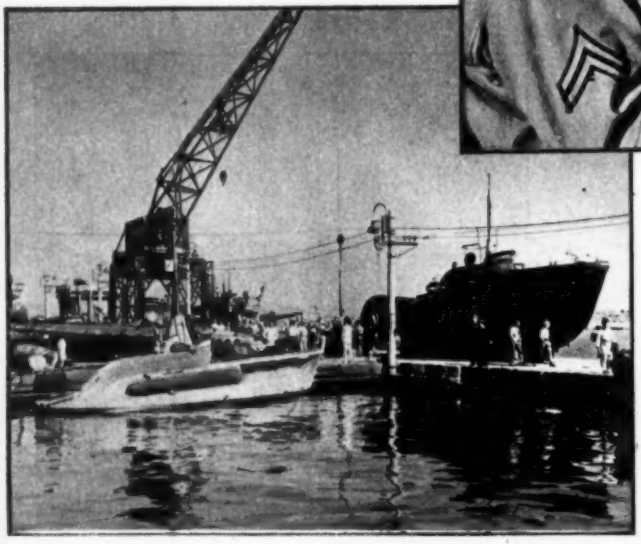


Blowing Up A Useful Building

AT THE left is inflation of a practical, productive kind. In Los Angeles they are "blowing themselves" to new buildings. To produce this mammoth igloo, a sturdy and cheap building that can have solar heat and light, concrete and insulating material are poured over the outside of an inflated bag, or form. When the concrete has hardened, the canvas bag is deflated and removed. An industrial, mushroom village of this kind isn't far off in time, will be a model of healthful working.

Battle Eyes That Are Official

FROM the combat pilot's angle this little camera is a welcome referee. In the thick of it—in those aerial barroom brawls—it's hard to know who shot whom—it's plenty tough to give credit where it's due. To the Intelligence officer it means certain determination of shot-down enemy craft. Wing camera records fights as bullets fly. Here it comes out of the wing of a P-47 Thunderbolt.

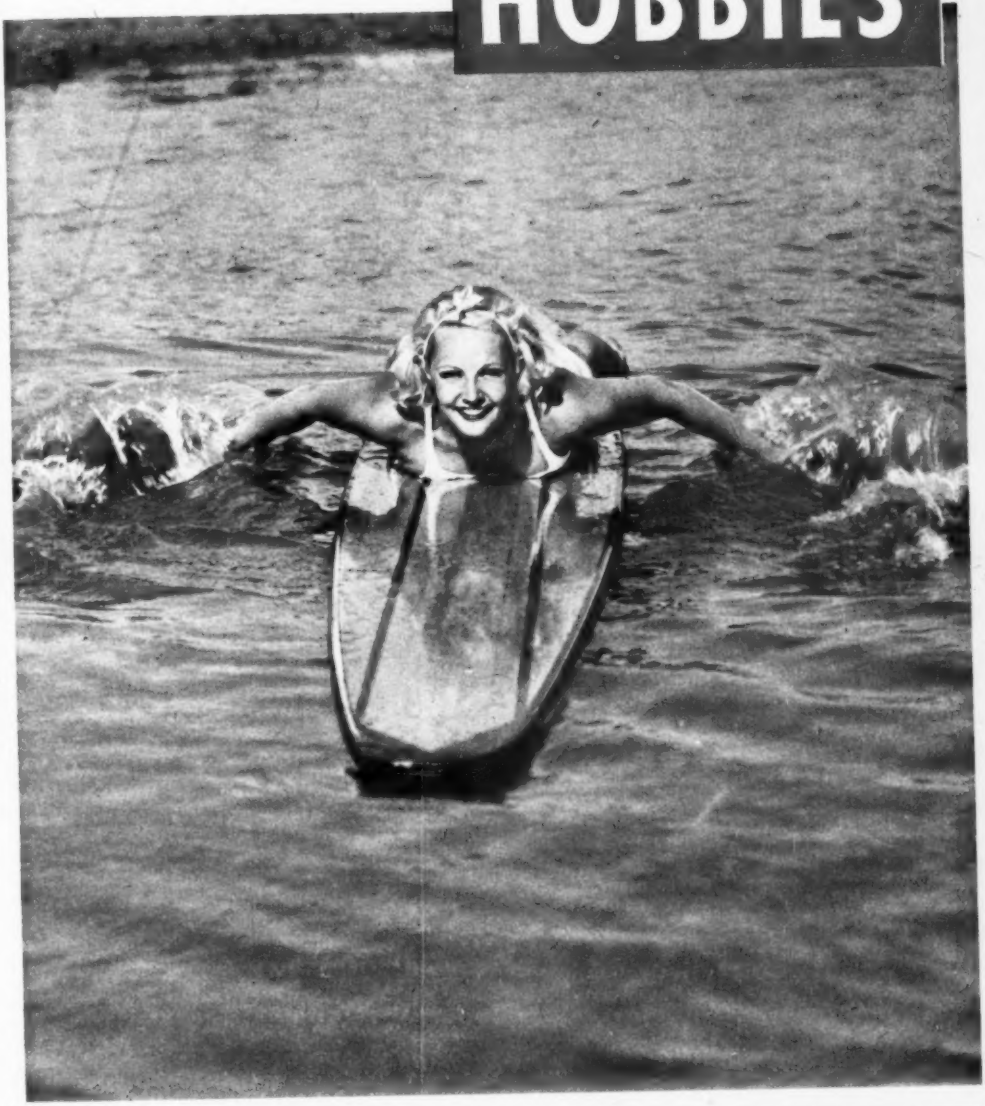


A Wee Cruiser That Dives

OR, IF you wish, a sub that cruises and looks like a cruiser. The Italians handed them over at Malta for the official capitulation. Here they are in the harbor of Taranto, where powerful units of the Italian fleet surrendered without firing a shot Note torpedo tubes affixed to sides of craft.

CRAFTS AND HOBBIES

Streamlined paddleboard. See page 118.



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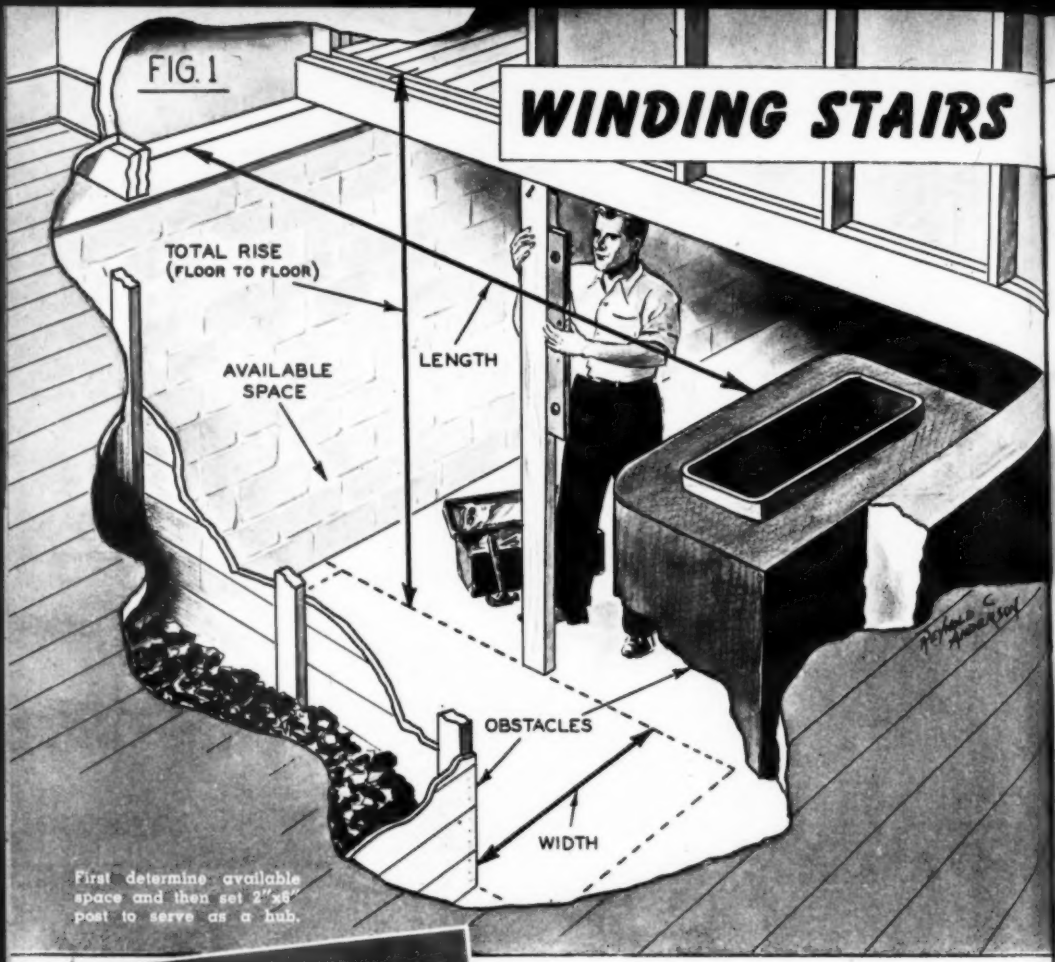
WINDING STAIRS

FIG. 1



First determine available space and then set 2"x8" post to serve as a hub.

This is the completed staircase, built to fit.

by J. Modroch

WHEN planning improvements and alterations for the attic or cellar of a home, the problem of allocating new stair space is likely to arise. Frequently, after deciding on the placement of partitions for the creation of extra rooms in the attic or the layout of a coal bin and heating plant in the cellar, the space that remains is too small to accommodate the existing straight-run stairs and, as this type cannot be shortened to any appreciable degree without making it dangerously steep, the chances of making it fit by rebuilding it are slim. The situation is one which need not cause you great worry. There are a number of remedies to which you may have recourse.

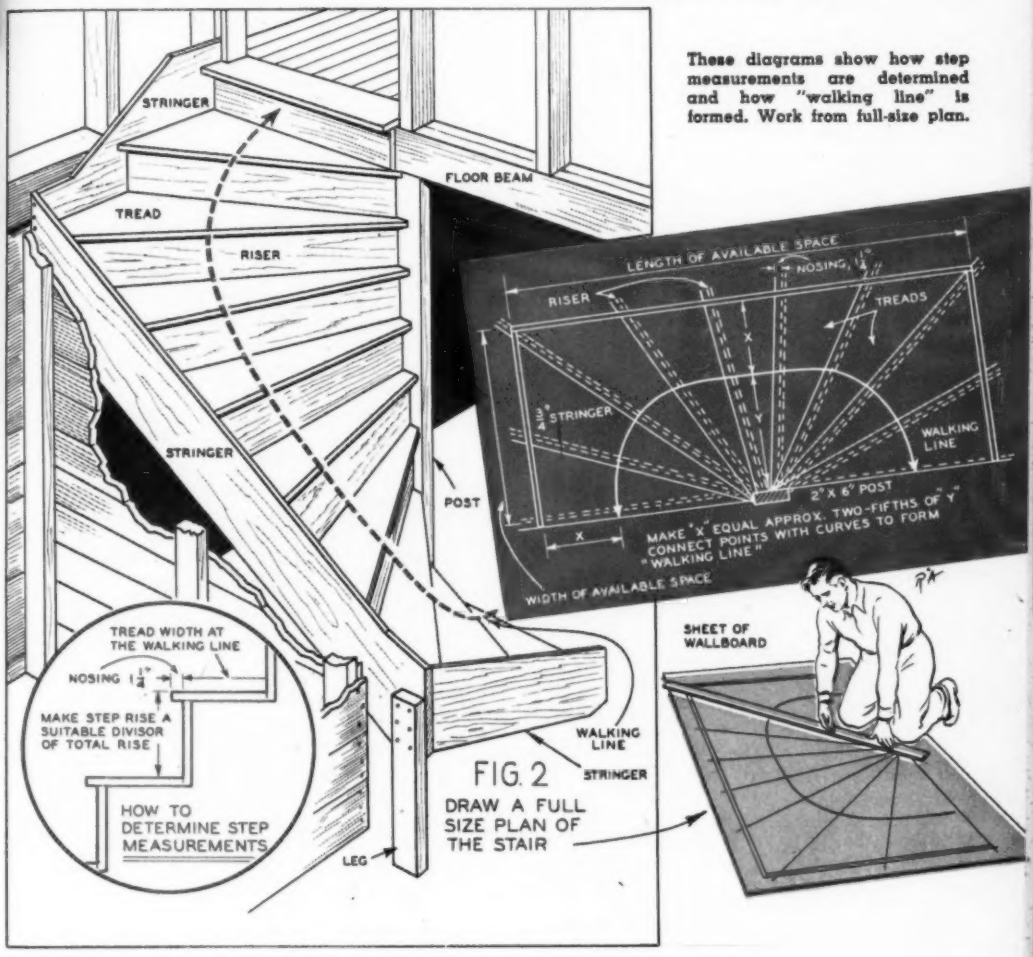
The solution to the problem may be the installation of a stairs of the winding type which requires less space to serve the same

ARE SPACE SAVERS

purpose. Here is a method of designing and building one.

For determining the number of steps that a proposed stairway should contain, there are certain recommended standard step measurements that will serve as a guide. The average person needs a tread width of at least 8¾″ to maintain sure footing when walking up or down a flight of steps. This is a minimum and, for the sake of safety, should never be reduced. The most comfortable tread width is considered to be around 13″, but is practical only on long, sweeping flights. On ordinary stairs, a tread width of about 9½″ is desirable. (To simplify these comparative figures, the tread widths given include the tread nosing, which ordinarily is considered separately when referring to tread measurement. For example, the 8¾″ figure includes a tread width of 7½″ plus a standard nosing of 1¼″.) The ideal height for a step is about 6″ but a rise of 7 or 7¼″ is more practical for the usual home stairs. To cut labor costs, rough-built stairs in barns and garages may be made with a step rise of 9″ providing the tread is made large enough to compensate for this extreme height. However, where limited space makes it necessary to use the minimum tread width of 8¾″, the rise should not be more than 7¾″

Since the method for breaking down a given space into steps for a winding stairs uses the



These diagrams show how step measurements are determined and how "walking line" is formed. Work from full-size plan.

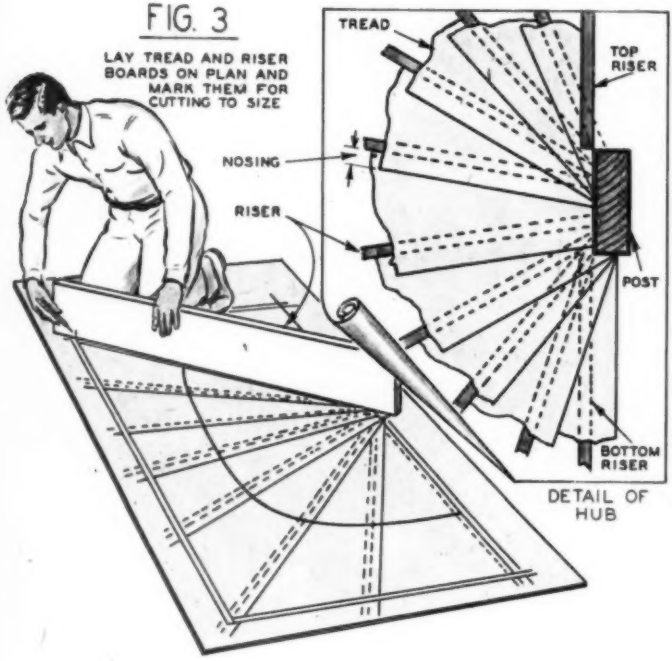
FIG. 2
DRAW A FULL SIZE PLAN OF THE STAIR

Cut treads and risers as shown in photo and diagram. Large pieces will have to be made for the wider treads.

same basic principle as the method for designing the straight-run type, let us simplify our explanation of the principle by applying it to the latter, which is easier to visualize.

To arrive at the number of steps for a straight-run stairs, we must first divide the total rise (distance from floor to floor) by a suitable step rise that falls within our recommended riser limits. This gives us the number of risers which, in any stair, always amounts to one more than the number of treads. Then, by dividing the total run (horizontal distance between the face of the bottom and top risers) by the number of treads, we get the tread width (less the nosing).

If the result comes within our recommended tread limits, we may let our figures stand as satisfactory. However, if it does not, then we must try a different step rise that will make it come out right by increasing or decreasing the number of steps. Since the space available nearly always permits a slight variation of the total run, this measurement also may be altered one way or the other to achieve the results we desire. Finally, the distance between the overhead beam and the step that will come directly under it must be checked for assurance that the stairs will have the proper headroom which should measure 6′ or more. See Fig. 6.



The job of designing a winding stairs calls for a slightly different method of gauging the total run before it can be manipulated with relation to the total rise. A simple way to determine a satisfactory layout for the treads is to draw a full-size plan of the stairs on a sheet of wallboard, as shown in Fig. 2. Begin by ruling in the stringers as dictated by the length and width of the space available. Then establish the "walking line" in accordance with the width of the flight at its narrowest point as indicated. The "walking line" (the equivalent of the total run in a straight-run stairs) should

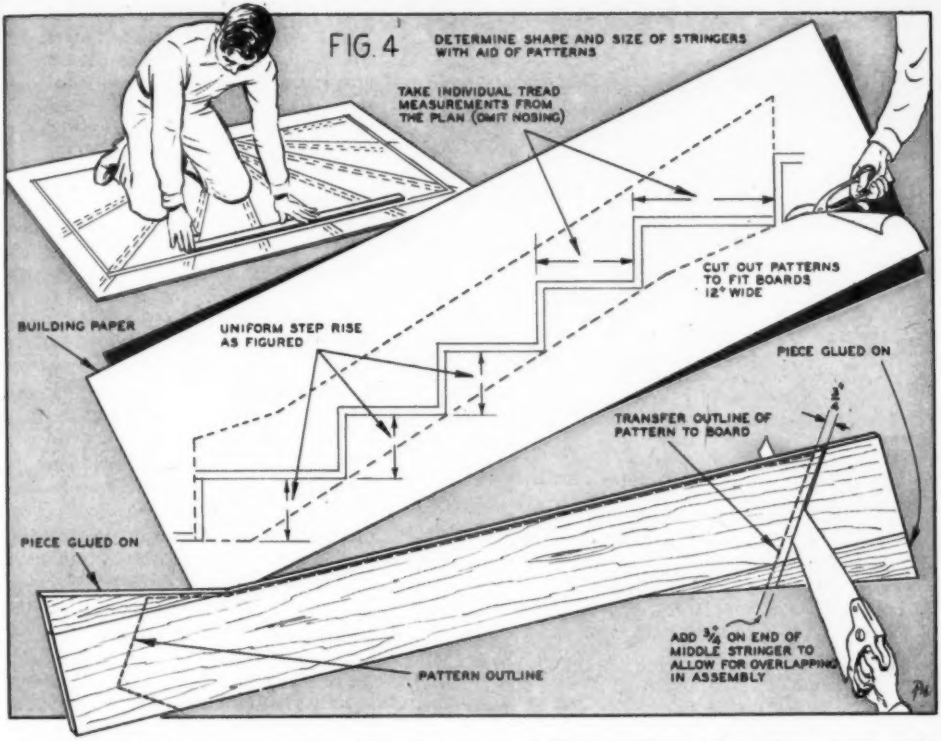


FIG. 4
DETERMINE SHAPE AND SIZE OF STRINGERS WITH AID OF PATTERNS
TAKE INDIVIDUAL TREAD MEASUREMENTS FROM THE PLAN (OMIT NOSING)
CUT OUT PATTERNS TO FIT BOARDS 12" WIDE
BUILDING PAPER
UNIFORM STEP RISE AS FIGURED
PIECE GLUED ON
TRANSFER OUTLINE OF PATTERN TO BOARD
PIECE GLUED ON
ADD 3/4" ON END OF MIDDLE STRINGER TO ALLOW FOR OVERLAPPING IN ASSEMBLY
PATTERN OUTLINE

Cut patterns for the stringers from strips of red rosin building paper or other cheap paper stock.

then be divided into treads by using as the divisor a suitable dimension within our standard tread width limits, and one that works out with a satisfactory step rise as previously explained. If the stair space is quite limited, you will probably have to use the minimum tread width of 7½″ or a dimension very close to it. Now draw the tread lines through these division points as shown, bringing them, along with their corresponding nosing lines, into the post at points that will permit the pieces to be toenailed firmly in place when assembling. Then complete the plan by dotting in the riser lines.

The bottom step of a winding stairs does not necessarily have to be set flush with the post as it has been in the one shown here. If space permits, it may be set ahead of the post and allowed to extend into the room which, in the case of a straight-run design, would be the equivalent of extending the total run. However, any variation, such as this, that is made for the purpose of working out satisfactory step measurements, should retain the recommended headroom or 6′ minimum as mentioned earlier.

With the plan as your template, you now can mark the lumber for cutting the treads and risers to size, as illustrated in Fig. 3. Some of the treads, because of the great width at the stringer end, will have to be cut from boards composed of two or more pieces glued together. It is recommended that these pieces be joined with dowels spaced about 10″ apart to hold them in line if the glued joints should part as a result of long use or dampness.

The size and shape of the three stringers can be determined with the aid of patterns cut from strips of red rosin building paper or some other inexpensive paper stock. To make these, draw a profile of the steps, or the steps and portions of steps that fall on each stringer, as shown in Fig. 4. Cut out the patterns to fit the width of 12″ boards so that the surplus will extend above the step line. Lay the patterns on the boards and transfer their outlines as indicated. Then saw the pieces to shape, allowing an extra ¾″ on each end of the middle stringer for overlapping when nailing the stringers together.

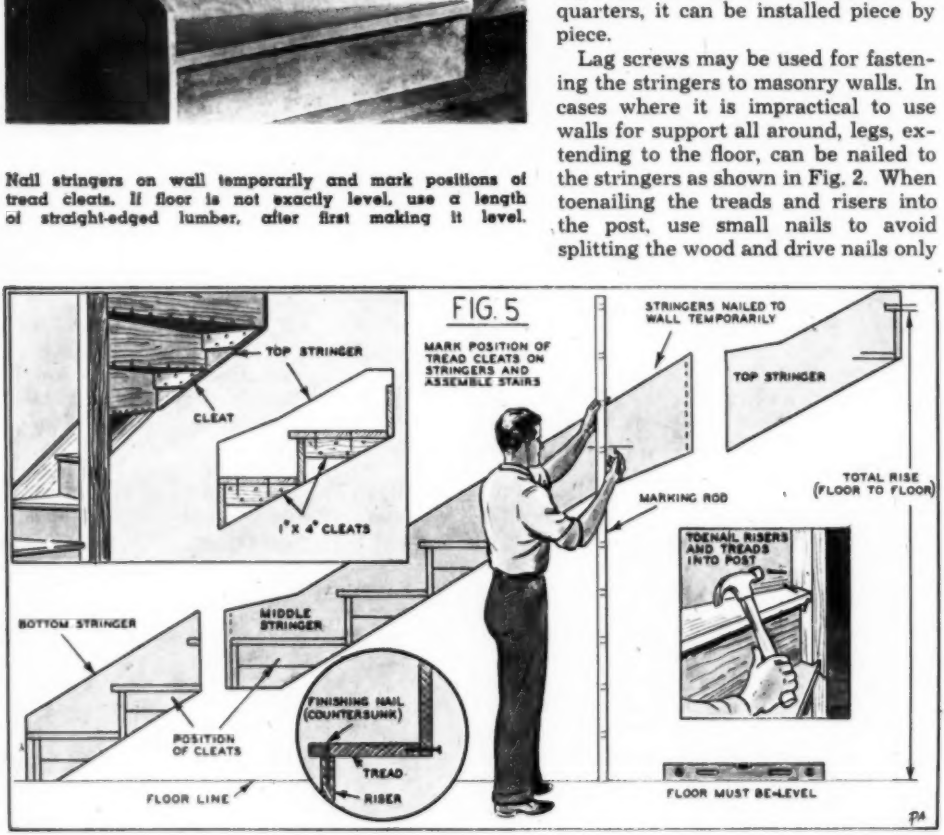
Nail the stringers on a wall or other upright support temporarily, in order to mark the

Nail stringers on wall temporarily and mark positions of tread cleats. If floor is not exactly level, use a length of straight-edged lumber, after first making it level.

position of the tread cleats, as illustrated in Fig. 5. If the floor is not uniformly level, use a length of straight-edged lumber as the base line, after first making it perfectly level. The marking rod shown should be made with extreme care and the mark for each successive step rise checked back with the base, or starting end, to insure uniformity and accuracy of all measurements. The top mark, of course, must check with the total rise of the stairs.

The manner in which a winding stairs should be installed depends on the amount of working room offered by the stair space. If it can be placed into position as a unit, it usually is advisable to assemble it beforehand. Where it must be built in a shop, it might be best to assemble it in sections small enough to be moved through doorways and between existing obstructions. In extremely close quarters, it can be installed piece by piece.

Lag screws may be used for fastening the stringers to masonry walls. In cases where it is impractical to use walls for support all around, legs, extending to the floor, can be nailed to the stringers as shown in Fig. 2. When toenailing the treads and risers into the post, use small nails to avoid splitting the wood and drive nails only



at points affording sound anchorage in the post.

For practical purposes, $\frac{1}{16}$" is the smallest fraction that should be used in working out step measurements in relation to available stair space. The value of any measurement based on a fraction finer than this is lost in the unavoidable variation of pencil marks, and the gain and loss that results does not make it worth while. For this reason, the height of the stair may vary somewhat from the floor-to-floor measurement when assembled. Where this is liable to occur, the experienced stair builder favors an assembly that runs oversize rather than undersize, for he can then trim a little off the bottom and top risers to bring the stair into perfect alignment with the upper floor.

Needed working space can be cleared on the ground floor of barns and garages having cramped stairs leading to a loft by supplanting the usual landing and extension steps with a quarter segment of winders as shown in Fig. 6. The bottom step of the improved stairway terminates flush with the rail post, thus eliminating the steps that formerly extended out into the room. The open-side stringer of a rough-built stairs such as this is usually made of 2" material, the posts are 4"x4" and the rail is built up of a 2"x2" capped with a 1"x3". The standard rail height for stairways is 2' 6", measured from the floor at the post.

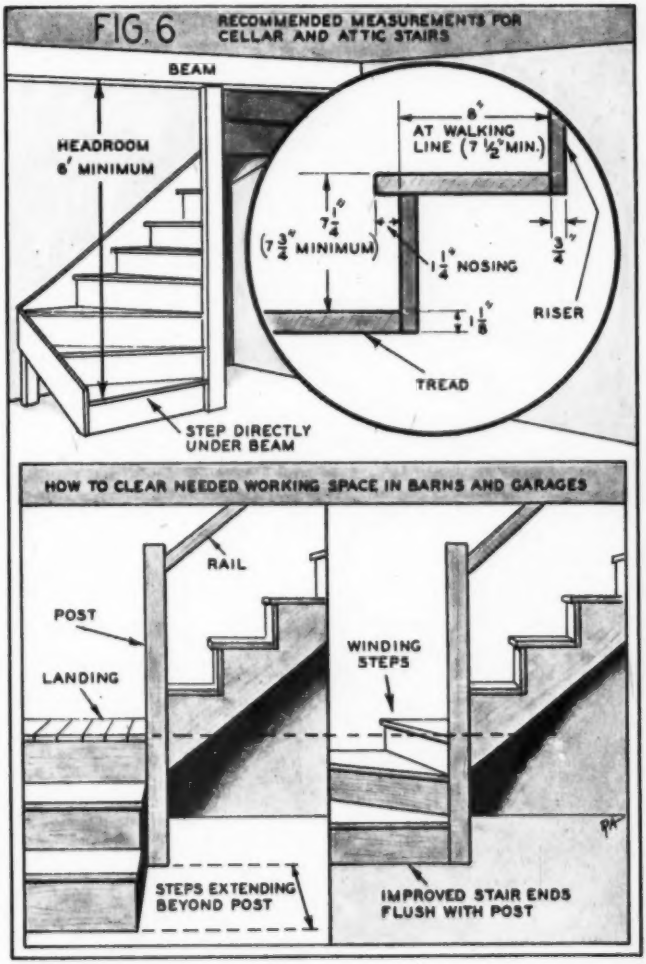
Study carefully the problems which confront your particular stair project and be sure to lay out complete plans before attempting any construction. Take into consideration all obstacles and make allowances for them; it's too late when your stairs are half completed and you discover you didn't allow quite enough room to clear the coal bin or furnace.

Protecting Workers' Badges

ALL defense and war plants today require their employees to wear on the job a button or some kind of identification badge. The loss of this badge means a fine or loss of time and work, not because of its intrinsic value, but because of the chance of its falling into unauthorized hands.

Simply paste a piece of paper on the back of your badge, write your name and address on it and add a 3-cent stamp. Then, if it is lost, the finder can place it in the nearest mailbox, and it will be returned with little loss of time.

Space can be saved in barns and garages by using stair winders.



ANEMOMETER

OLD CAR SPEEDOMETER GIVES IT THE "WORKS"

Wind velocities can be measured with better than 95% accuracy by means of this home-made instrument. Just the thing for pilots!

by Raymond F. Yates

Completed "windmill" registers wind speed on magnetic auto speedometer.

EVERY amateur meteorologist wishes to have some accurate method of measuring wind velocities and even the more inexpensive anemometers are far too costly for amateur use.

An ordinary speedometer of the magnetic type (practically all cars have these) which may be purchased reasonably at the auto junk yard, may readily be converted into an anemometer which will record wind velocities ranging from 5 to 100 miles per hour with a plus or minus error margin of less than five per cent. The speedometer illustrated and used for the original anemometer came from a 1933 Ford but any kind will do as long as it is magnetic.

The main shaft of all speedometers is connected to the mile counter through a small worm gear. Since the mile counter cylinder is not needed for wind velocity measurement, this gear is first removed to relieve the drag and to make the instrument more sensitive.

Speedometer frames are usually zinc die castings, and it generally will be found that the worm gear bearing may be completely removed with a hacksaw. It will not be necessary to remove the tabulator itself.

Main shaft of the speedometer, which carries a circular magnet, is now equipped with a small windmill such as is shown in the drawing and the photos. The blades of the windmill are so arranged on the hub that their pitch may be adjusted for purposes of calibration, as we shall see.

The hub itself may be turned from most any metal or simply sawed off a

Closeup of dial face (above) shows mileage register blacked out as it is not needed. Left: Gears controlling this part are removed to reduce the drag.

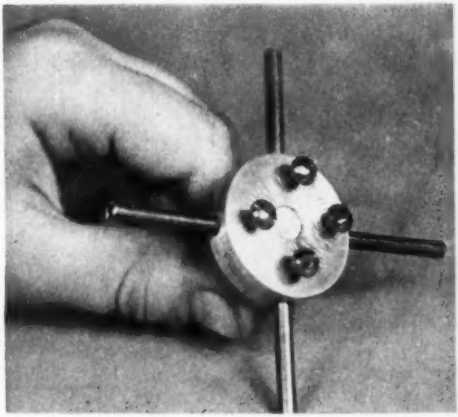
piece of rod stock of the right diameter. If at all possible, the center hole should be drilled on a lathe for accuracy. Wobble or eccentricity will greatly interfere with accuracy. Brass or cold rolled steel rod may be used for the hub of the shaft and the method of connecting this to the main shaft of the speedometer will depend largely upon the construction of the speedometer used. Solder was used in the original instrument. Naturally, there is little strain here and solder is quite sufficient.

Eighth-inch brass rod (or curtain rod) may be used for the shafts of the wind vanes and these fit in four ⅛" holes drilled 90 degrees apart in the periphery of the hub. Four 6/32 set screws are installed in the hub so that the vanes may be set at a particular angle and held there during calibration. Solder the sheet-metal vanes to their "spokes."

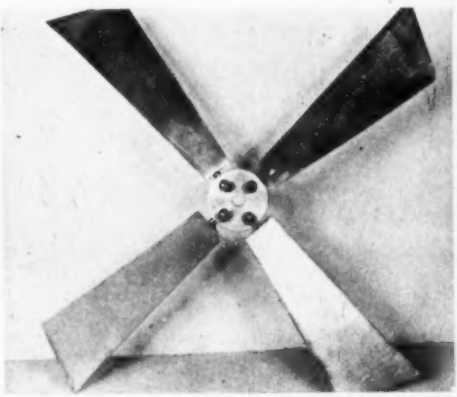
The mechanical part of the work is completed with the installation of the handle, which may be a piece of cold rolled bar of sufficient size. This is bent where it is attached to the speedometer so that the instrument will be in the proper position for reading and the windmill facing square to the wind when in use. The shafts of all speedometers enter the cases at an acute angle.

Calibration is easy enough, but it should be done carefully if the anomometer readings are to mean anything. The calibration is done on a perfectly quiet or windless day by the use of an automobile. The instrument is held out of the car window at arms' length and the car is brought to a speed of 25 miles an hour. The vanes of the windmill are then regulated until the car speedometer and the converted speedometer agree.

Locate the anemometer in a place as high as possible and free from obstructions.



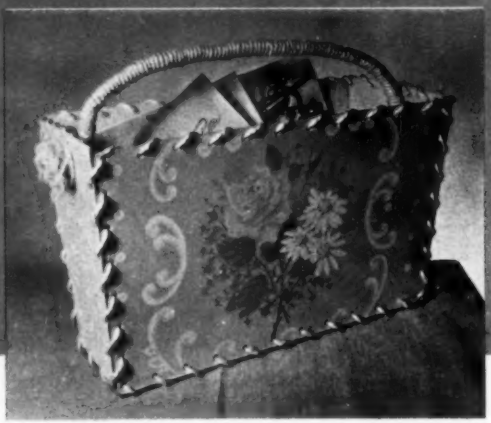
Hub of rotor is drilled to receive vane spokes. Vanes are made adjustable in pitch by four set screws.



Vanes assembled on hub. Calibration of anemometer is made by adjusting vane pitch while driving in car at known speed, holding instrument in wind stream and then checking it against the car's speedometer.

MAGAZINE RACK

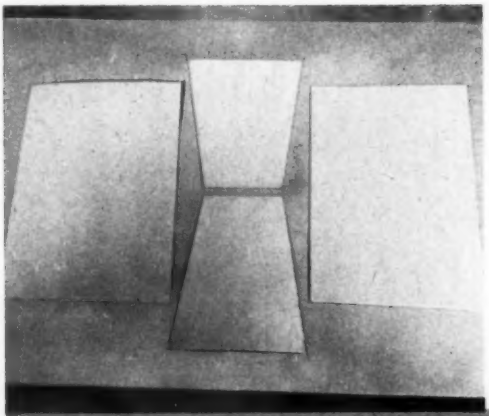
Photos by Rene Leonhardt



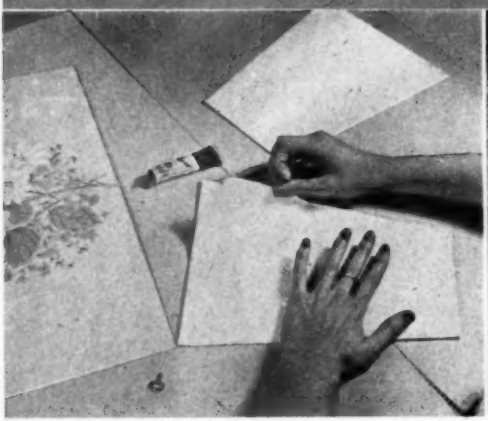
Finished rack is seen at left. It can be attractively decorated with floral designs.

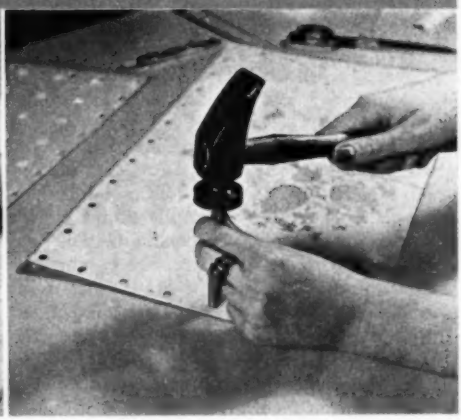
THIS magazine rack is both decorative and serviceable, and no great degree of artistic talent is required to make it. The only materials required are: some heavy cardboard, twine, wire and a few pieces of wallpaper or scraps of printed fabric. About 15 yds. of twine and 6 yds. of wire will be sufficient. Your tools will be: a hammer, punch, ruler, sharp kitchen knife, pencil, glue and a pair of large scissors.

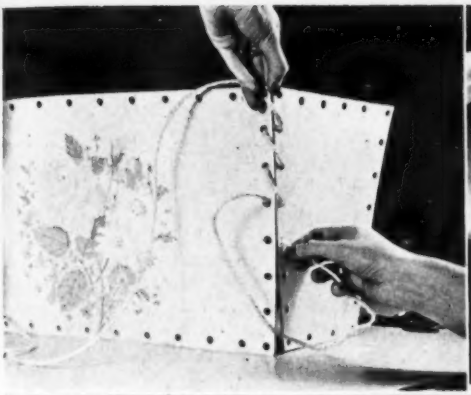
The side and end pieces are 11" high, wider at the top than at the bottom. The sides are 16¾" long at the bottom, tapering to 17" at the top. The ends are 5½" long at the bottom, tapering to 8½" at the top. Make sure that the pieces are symmetric and that one edge does not slant more than the other. Top and bottom edges must be parallel. Bottom is made last as shown.

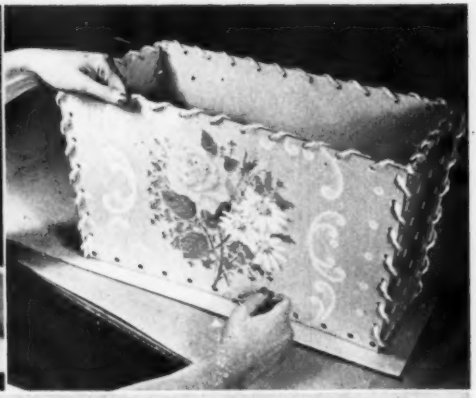


When you have cut out the four sides of the rack, trace or glue designs on them, and then draw a line ½" in from all edges. Use the hammer and punch to make holes along this line, 1½" apart.

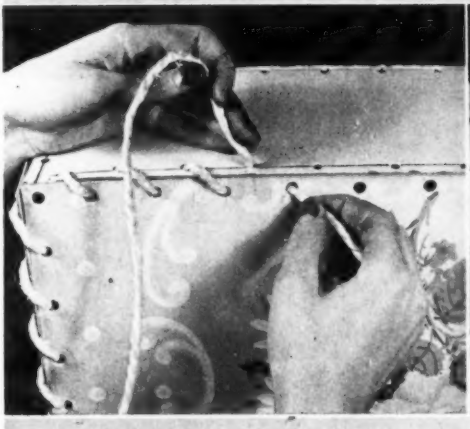


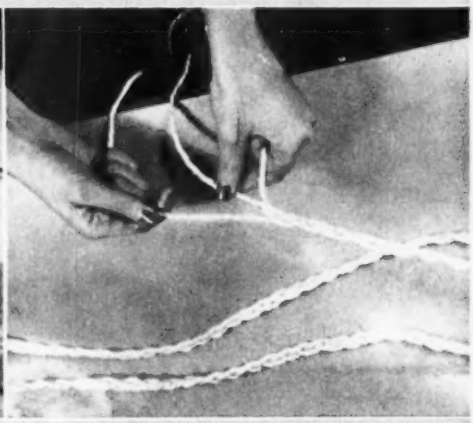




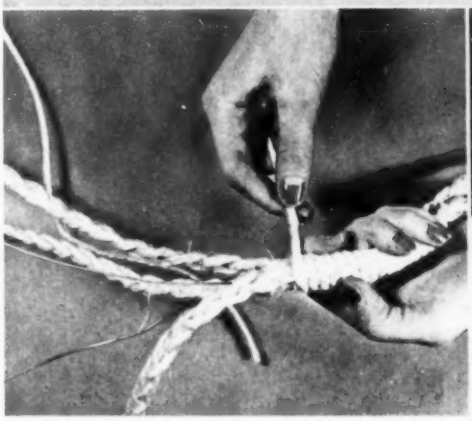


The next step is to link the four sides together by pulling the twine through the holes as shown. Then stand the sides on another piece of cardboard, trace and cut out the bottom.





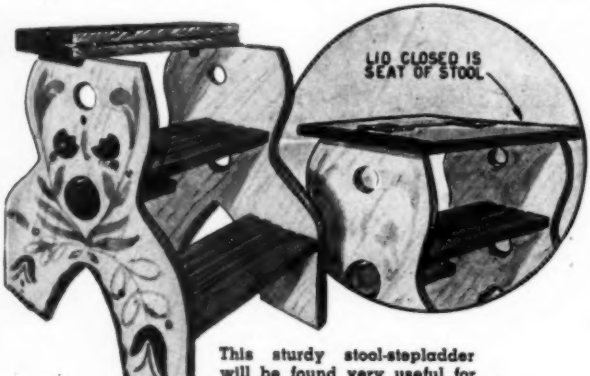
Punch holes in bottom and fasten with twine. For handle make three braids of three strands each, insert wire in each braid, wrap with twine, push through holes in basket and knot.



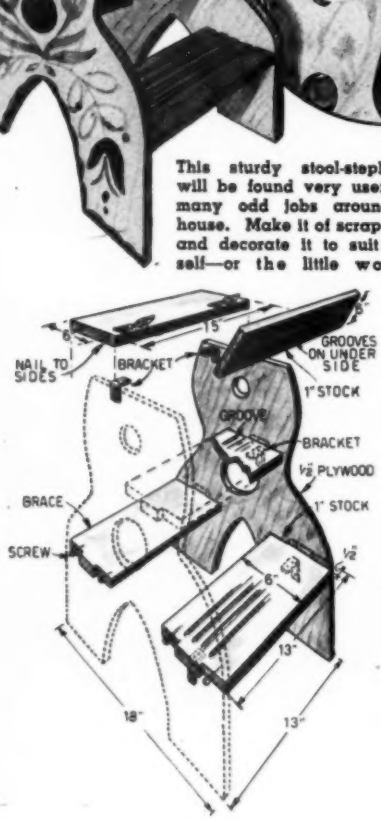
HOUSEWARE FROM WOOD

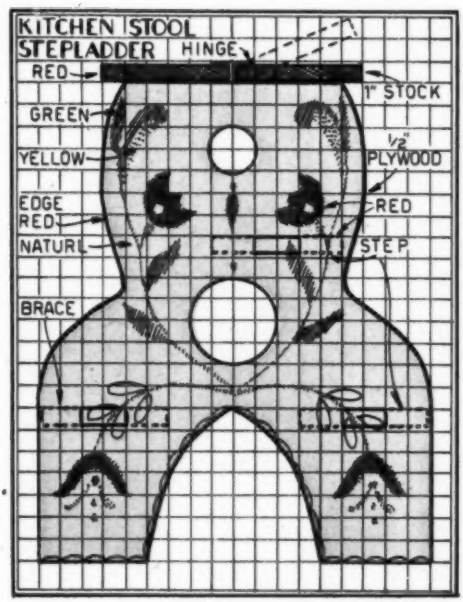
by Roberta Fairall

Mobile Clothes Basket—This wooden clothes basket has a compartment to hold clothes-pins, wheels and a handle so that it, after being filled, may be pushed out under the clothes-line instead of having to be carried. The sides are cut from ¼" plywood or presdwood and have a row of decorative wooden flowers, cut from ¼" stock, tacked and glued along the top. The bottom, 23½" x 18", is cut from 1" x 6" surfaced stock. A 1" x 1" piece 18" long is nailed between the sides at each end and 2" battens nailed to this and to the bottom. A section of ¼" stock is tacked in the front end to form a "V" which holds clothes-pins. A 1" x 2" section 42" long is nailed to each side; both ends are rounded, and holes drilled in the top for a ¾" dowel handle, and in the bottom for a ¾" dowel front axle. Similar sections 16" long rounded at the bottom and with holes drilled to support the rear axle, are also nailed to the sides at right angles to the 42" pieces. Brackets hold the two together. Six-inch wooden wheels are slipped over the axles and fastened on with wooden pins. The wheels are red, the cut-out flowers, red and yellow. A green leaf is painted between each flower or decals may be used if varnished over.



This sturdy stool-stepladder will be found very useful for many odd jobs around the house. Make it of scrap wood and decorate it to suit yourself—or the little woman.

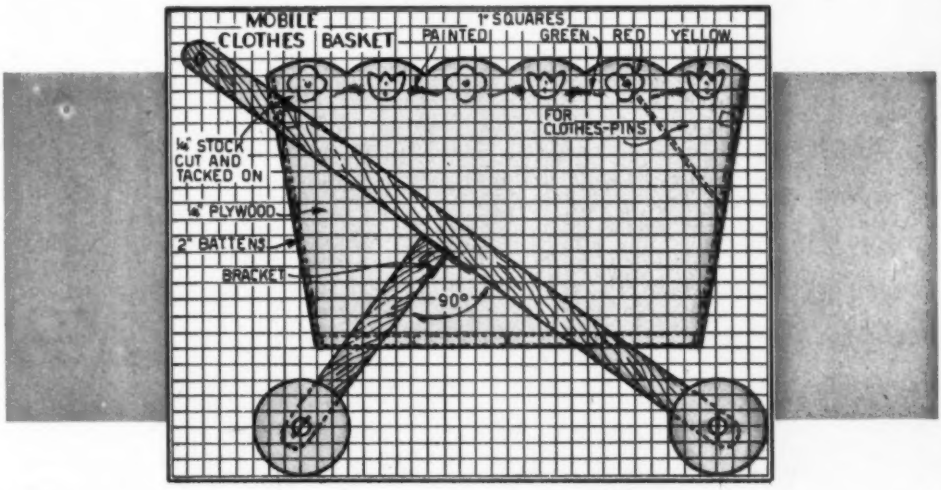


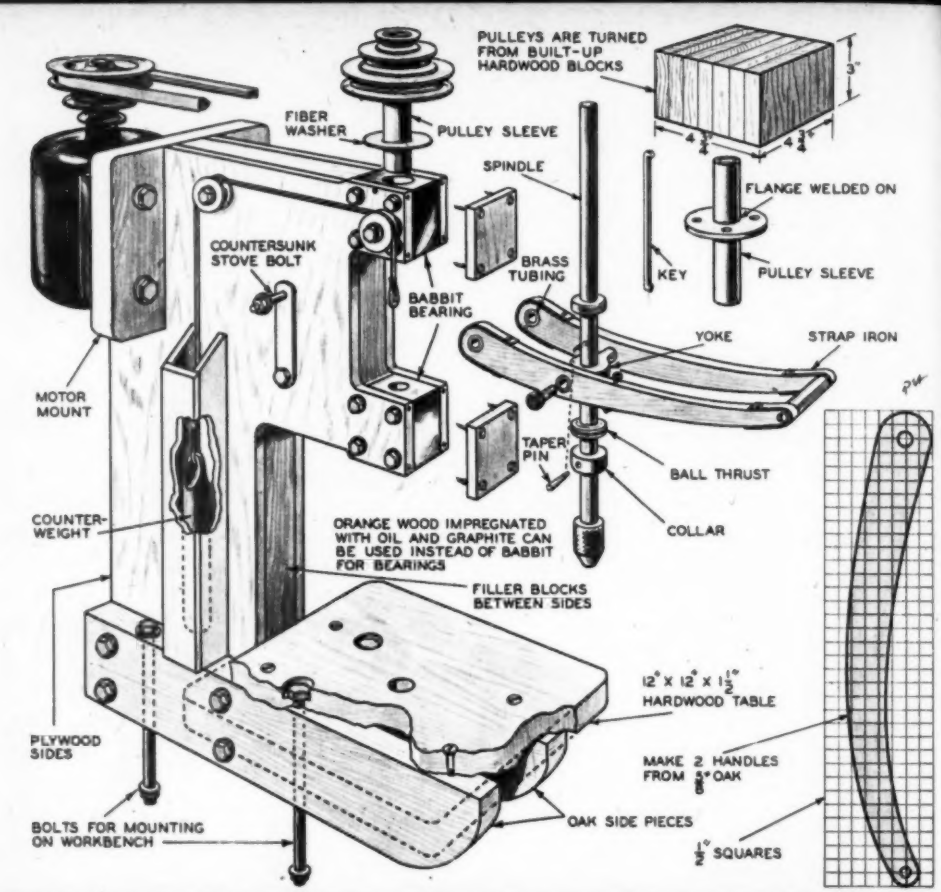


Here's a gadget your wife will love because it will save her many steps when it comes time to hang out the laundry. Can also double as grocery cart.

KITCHEN STOOL-STEPLADDER—To use this decorative stool as a stepladder, half of the hinged seat is merely turned back to form the top step. The two side sections are cut from ½" plywood or presdwood and ¾" x 2" holes cut where the steps and brace are to be set. The seat is two sections of 1" x 6" surfaced stock each 15" long. The back half is nailed to the top of the side sec- to this section is the front half grooved on the under side. The two steps and the back brace are cut from 1" x 6" surfaced stock each 13" long with two ½" x 2" notches at each end.

Grooves are cut in the top of each step, the three sections are set in the openings cut for them in the side sections and fastened with screws. A bracket is screwed under each side of the steps and the back half of the seat. The steps are red and a gay peasant design painted on the sides.





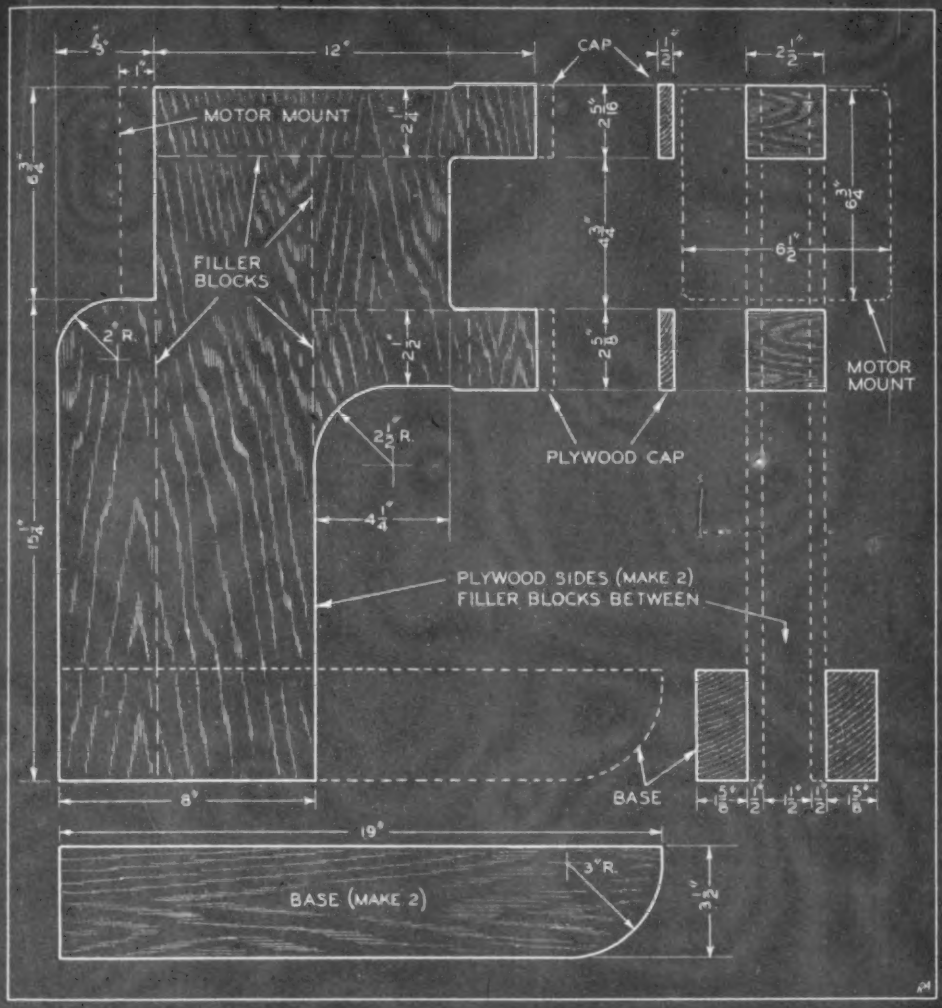
ALL-WOOD DRILL PRESS

by Hi Sibley

A ¼ h.p. motor will handle this home-built "non-priority" version of a useful shop tool.

DRILLING, routing, carving and many other operations can be performed on this sturdy little drill press, using regular drill press attachments, and it'll serve you well until such time as factory-built machines again become available. If your shop has never known the luxury of this time and labor-saving tool, get started building one right away—you'll be amply repaid for the small outlay in work and materials by the extra scope it will give your craftability.

Except for spindle assembly, sheaves, bolts and babbit bearings the entire drill press is

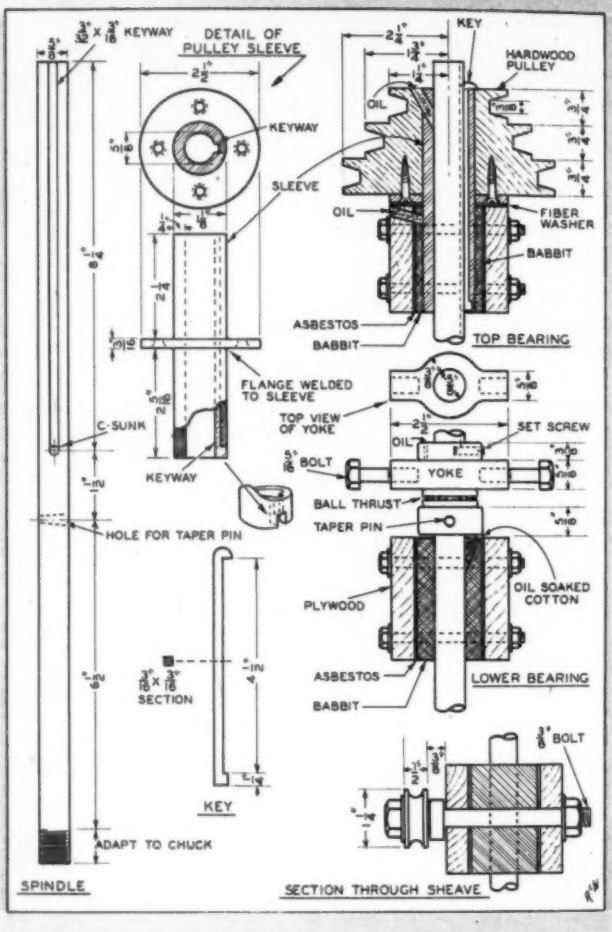


This plan gives shape and dimensions of principal wooden members of the drill press. Base and motor mounts should be of some tough, hard wood such as white oak or yellow pine.

made of wood, and even the bearings can be hardwood if preferred (see sketch). With an ordinary three-jawed chuck it will handle drills up to ½", and has a spindle thrust of about three inches.

General dimensions are given in the squared drawing, Fig. 1, showing the range of the wooden hand lever, mounting of motor, etc. Throughout it is designed for simple construction and obtainable materials. First scroll-saw the two side panels of ½" plywood and from 1½" material cut the filler blocks as shown in Fig. 2. Assembly is with screws and Cascamite plastic adhesive. Base members are not installed until the bearings are completed.

Next make the spindle, or have it made, as in Fig. 3 from drill rod or cold-rolled steel ⅝" in diameter, and a pulley sleeve in which the spindle may slide up and down. The sleeve has a welded flange and keyway, with key of cold rolled steel, made as illustrated. To pour the bearings, line the boxes with sheet asbestos, center the spindle by means of end blocks, as shown in Fig. 4, and place a sheet of asbestos with vent and pouring hole over



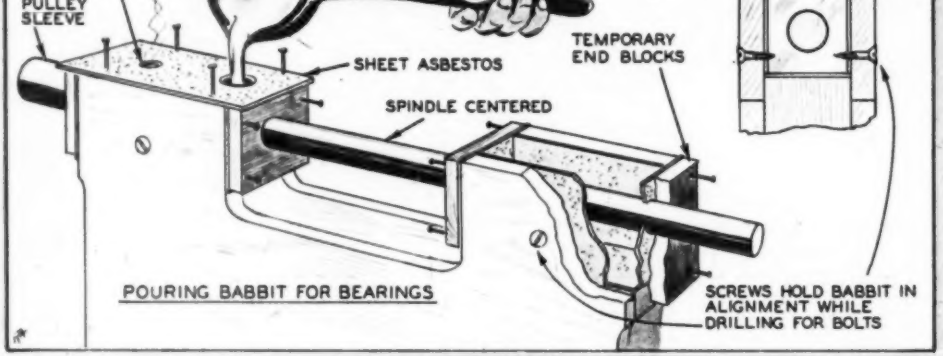
Details of spindle assembly. If ball race is unobtainable for thrust bearing use flat bronze washer. Below: Method for pouring of bearings.

each bearing. Note that on the upper bearing the pulley sleeve is in place on the spindle. Wood screws installed before pouring hold the bearings in alignment while holes are being drilled for the bolts.

Assembly of the upper bearing, pulley, sleeve, etc., is shown in Fig. 5. Note the ¼" hole bored at an angle in the top of the pulley for oil. This is stuffed with oil-soaked absorbent cotton or felt, thus taking care of the sliding spindle, while the revolving sleeve is lubricated through an oiler at the top of the bearing.

In Fig. 6 is shown the sheave for the counterbalance, turning on a bolt through the bearing in front of the spindle. The lower spindle bearing is shown in section, Fig. 7, also the yoke for the hand lever, with set collar above and ball-thrust bearing and collar below. The latter is secured with a taper pin. If a ball-thrust is not available, use a bronze washer, which will give more spindle travel.

The hand lever consists [*Continued on page* 132]



Your Invention Clinic

[Continued from page 14]

search reveals patentable features; and that you then take up the matter with a leading aeronautical designer and with manufacturers of airplane engines. It is likely that this form of installation will require modifications in engine design. Particular emphasis should be placed on the modified wing construction even to the extent of having wind tunnel tests made on the motor section of the wing itself. Mechanically this idea seems okay.

Stamp Applying Machine—Nail Puller—Theater Seat Locater

Richard Josephson, Jean Brilliant, Quebec, Canada, submits sketches of a stamping machine for Post Offices which could be used by the public to have letters stamped automatically upon inserting the proper coins in the slots; a light-panel seat indicator for use in theaters; and a nail puller.

ANSWER: *In accordance with our policy not to disclose details of an item which we believe possesses considerable merit, we are withholding the information you submitted about the nail puller. We would recommend that you investigate the patenting of this item and also that you build a working model to overcome some of the "bugs" which you are likely to find.*

We do not think that the cam mechanism is the best you could devise. It seems too weak. Presumably there is a two-way action. The first driving and the other extracting. By also adding an anvil which could be fitted directly into the jaws of the puller, this tool might be used to drive nails into cases. By a still further modification the mechanism could be entirely self-contained with the driving energy developed by a powerful spring, compressed by the principle of a hydraulic ram. These developments should give you plenty of work for the present.

Neither the stamping machine nor the seat locater are new. Throughout New York City automatic mailers are available. Some have been designed to make change at the same time that a stamp is affixed to the letter. The seat locater was in use in many New York theaters. In most places its operation has been discontinued.

Box Seal

David B. Egger, 324 E. Cranberry Ave., Hazelton, Pa., writes, "We intend to seal a box for proof against tampering. On certain boxes cord is to be used; on others wire is needed. The process must not be slow. Gummed tape is not satisfactory. Do you know of any method or device?

ANSWER: *Sealing wax often is used for this purpose. There are automatic mechanisms which apply a drop of hot wax directly on the package*

[Continued on page 157]

America's War Made Industry—

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The restrictions on the manufacture of electrical home appliances has greatly increased the need for and earnings of skilled home appliance repairmen. Always a good business, today ELECTRICAL APPLIANCE REPAIRING is one of the most profitable occupations that the average mechanically inclined man can turn to. On many types of repairs it is usual for a repairman to charge on the basis of $5.00 to $6.00 an hour! Work as many hours as you wish—for the home appliance repairman is his own boss. Operate from your garage, basement, vacant store, etc.

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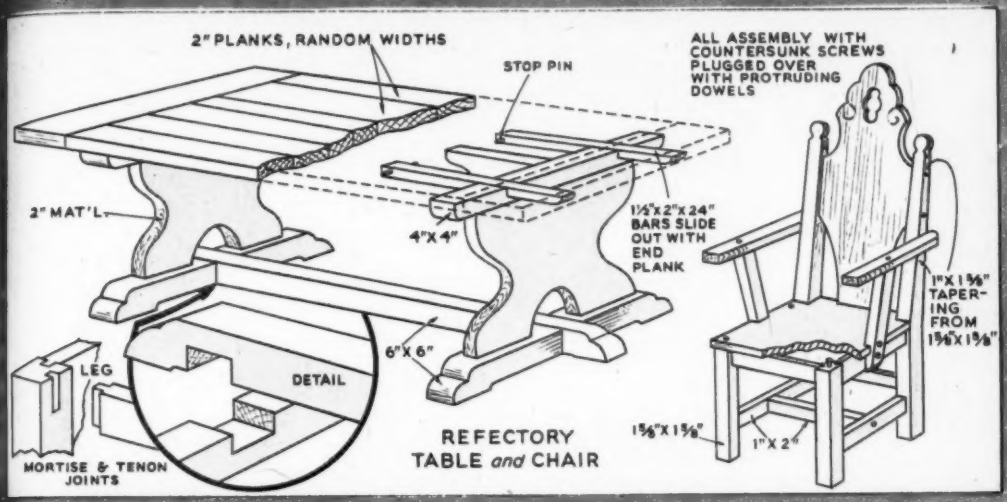
REFECTORY TABLE AND CHAIR

Attractive and sturdy yet simple in construction this dining set blends with rustic surroundings.

FURNITURE-MAKING is one of the most interesting and useful of all hobbycrafts, and the years of good looks and service obtained from a well-made and well-designed chair, table, desk or other articles more than repay the craftsman for his efforts. In addition he has a piece of furniture that could not be bought except at a high price, for handmade solid wood furniture, when it can be found is always expensive.

So if you want a new dining set that your family and friends will admire, get out your tools and start working on this attractive, rough-hewn refectory table and chair. You'll probably want at least four of the latter, and by cutting the pieces in duplicate before assembly, much time can be saved. Simplicity of construction keynotes this set, and practically any kind of lumber can be used that is available in the sizes given in the drawings. Assembly is with screws, well countersunk and plugged over with dowels or cross-grain wooden plugs. Lag screws are used in the framing of the table, as indicated.

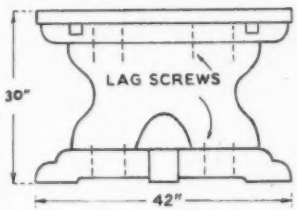
Note that the end members of the table slide out to permit insertion of leaves at each



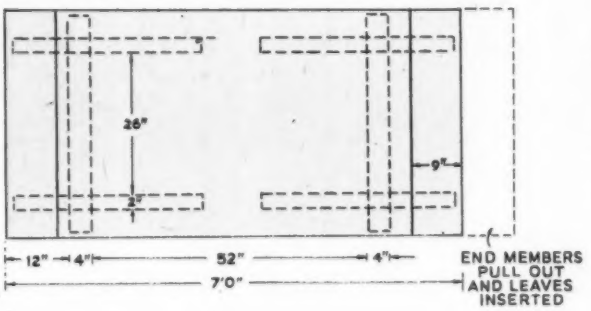
Above: Assembly details. The few curves in the heavier pieces can be cut at the mill on a bandsaw if you don't have the necessary equipment to do the job. Rest of work is straight sawing and fitting.

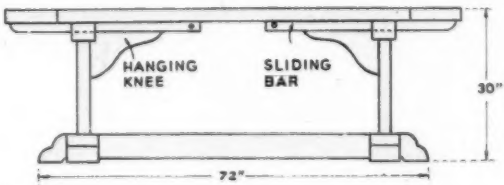
end, increasing the length by 18 inches. The main table-top is built of 2" planks in random widths, neatly fitted and glued together, and secured to the 4" by 4" cross members. These are screwed to the sturdy legs with lag screws, the legs mounted on 6" by 6" timbers in the same manner. Hanging knees insure rigidity of structure.

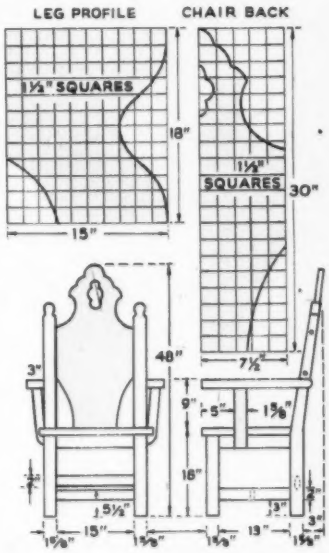
In the original set, host and hostess chairs at the ends of the table are made six inches taller than the [*Continued on page* 132]



Dimensions are given here, plus patterns for finding curved parts. Finish should be in keeping with the design and lumber used. For pine use dark stain and hard wax.





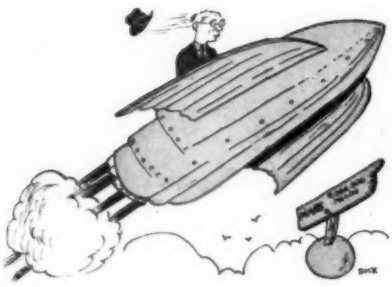


THE SCHOOL SHOP

Conducted by Gilbert Paust

Lieutenant, Civil Air Patrol, Westchester Squadron

Lesson 13—The Ocean of Air

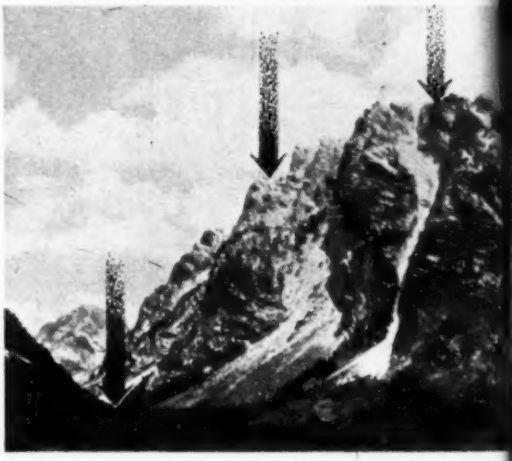


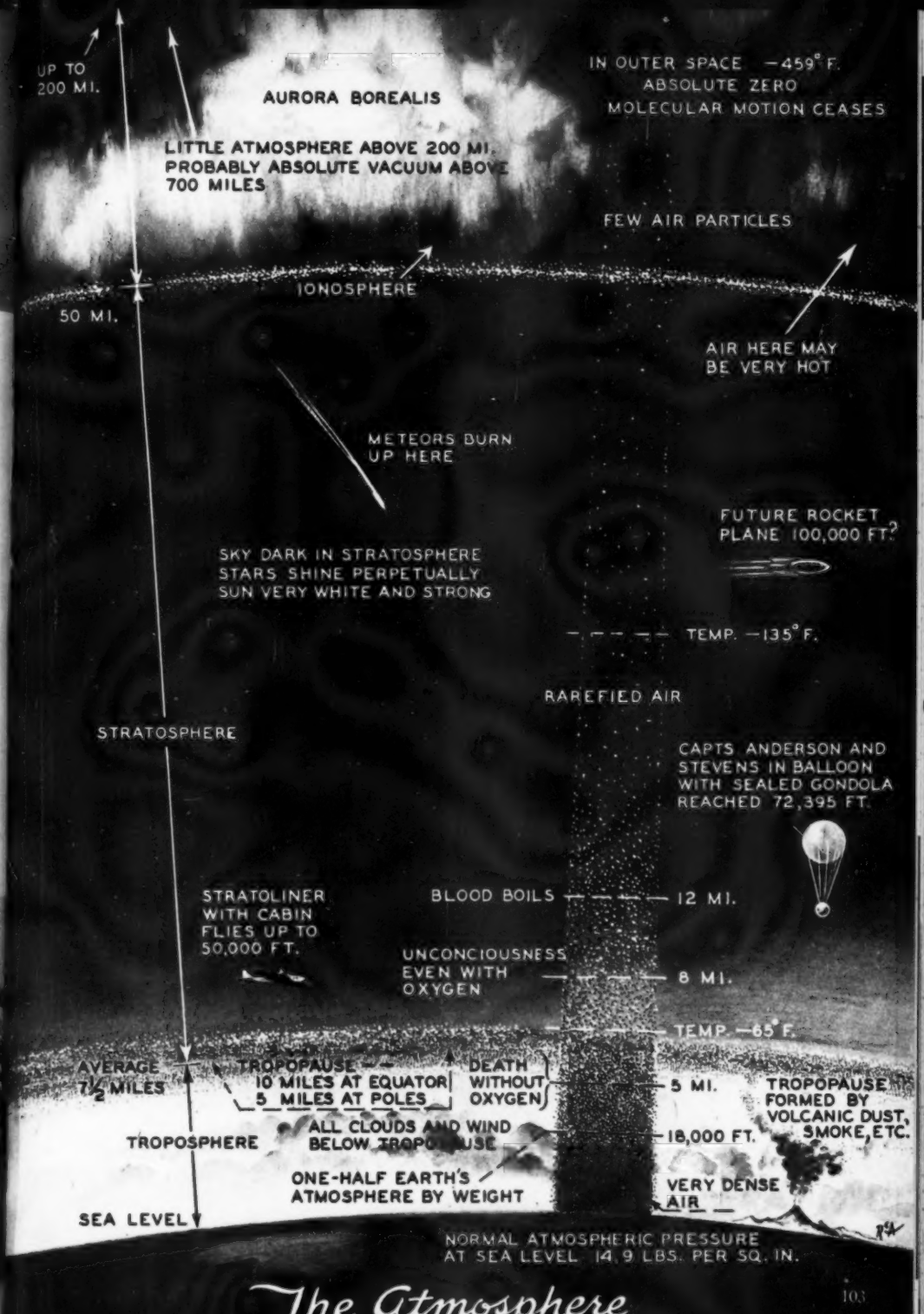
THERE is nothing in the world more interesting and awe-inspiring than the huge cavern of sky in which we live. The astronomer has traveled to some of its furthest reaches with his telescope, but there still remain vast, uncharted regions which challenge the pioneers of tomorrow. The ships these future pilots will fly will differ greatly from the ones in which we journey today, however. Perhaps they will operate on rocket power, or even by some revolutionary principle of which we don't dream at the present time. Now we must be content to confine our flying to the earth's atmosphere, and since this is the case, it might be a good idea to analyze this "ocean of air" about us before we study its peculiar properties which are known to the pilot as *weather*.

The atmosphere of the earth is a blanket of gases extending over its entire surface and held to it by the pull of gravity. Gases are composed of tiny particles of matter, and, as such, have weight. Our air is a mixture of a number of these gases. The one present in the largest quantity is *nitrogen*, and next in amount is *oxygen*. Oxygen is a very active gas and supports life, while nitrogen is very inactive and holds oxygen in check. The proportions of these two in the atmosphere are about 78% for nitrogen and 21% for oxygen. The remaining 1% is composed of water vapor, carbon dioxide (a product of combustion and the gas we exhale when breathing), hydrogen, and the rare gases: neon, krypton, argon, zenon, etc.

This blanket of gases is approximately 200 miles thick. Extending upward from the earth's surface for a distance of about 10 miles at the Equator and 5 miles at the poles is the region known as the *Troposphere*. This is our part of the "ocean." A dividing layer at this altitude separates the Troposphere from the rare air above which is called the *Stratosphere*. This layer, called the *Tropopause*, is a thin cloud-like structure composed of volcanic dust, sand, etc., and held up by warm, rising currents of air from the surface. It is higher at the Equator because the earth is hottest there. Scientists tell us that the Stratosphere ends at approximately 50 miles, above which is a very peculiar region named *Ionosphere*. Not much is known concerning its structure. We guess that its air must be very thin. It is here that the aurora borealis

Atmospheric pressure decreases with altitude.



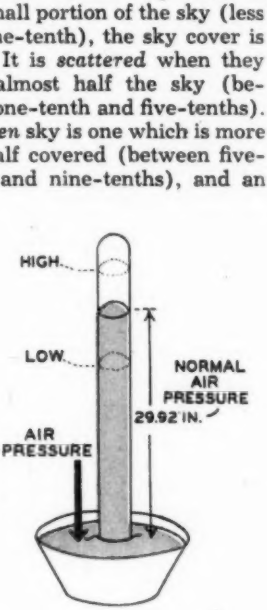

UP TO 200 MI.
AURORA BOREALIS
LITTLE ATMOSPHERE ABOVE 200 MI. PROBABLY ABSOLUTE VACUUM ABOVE 700 MILES
IN OUTER SPACE —459° F. ABSOLUTE ZERO MOLECULAR MOTION CEASES
FEW AIR PARTICLES
IONOSPHERE
50 MI.
AIR HERE MAY BE VERY HOT
METEORS BURN UP HERE
FUTURE ROCKET PLANE 100,000 FT.?
SKY DARK IN STRATOSPHERE STARS SHINE PERPETUALLY SUN VERY WHITE AND STRONG
TEMP. —135° F.
RAREFIED AIR
STRATOSPHERE
CAPTS ANDERSON AND STEVENS IN BALLOON WITH SEALED GONDOLA REACHED 72,395 FT.
STRATOLINER WITH CABIN FLIES UP TO 50,000 FT.
BLOOD BOILS
12 MI.
UNCONCIOUSNESS EVEN WITH OXYGEN
8 MI.
TEMP. —65° F.
AVERAGE 7½ MILES
TROPOPAUSE
10 MILES AT EQUATOR
5 MILES AT POLES
DEATH WITHOUT OXYGEN
5 MI.
TROPOPAUSE FORMED BY VOLCANIC DUST, SMOKE, ETC.
ALL CLOUDS AND WIND BELOW TROPOPAUSE
18,000 FT.
TROPOSPHERE
ONE-HALF EARTH'S ATMOSPHERE BY WEIGHT
VERY DENSE AIR
SEA LEVEL
NORMAL ATMOSPHERIC PRESSURE AT SEA LEVEL 14.9 LBS. PER SQ. IN.

The Atmosphere

Pilot balloon observations (PIBALS) determine velocity and direction of winds aloft. Drift of balloon is observed through an instrument known as a theodolite.

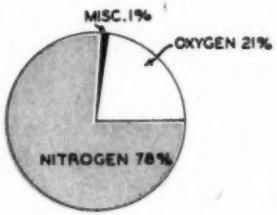
occurs, and also strange black clouds which have not yet been explained. The Ionosphere is a "radio roof," from which all radio waves transmitted from the earth bounce back again. With respect to temperature, some say it is a region of intense heat, but this remains to be proved.

All clouds, winds, and weather occur in the Troposphere, where we do all our flying, for above the Tropopause the air is too thin for these conditions. The clouds, which we discussed in the last lesson, may reach almost to the Stratosphere but not beyond. They form what is known as the *sky cover*. When they cover a very small portion of the sky (less than one-tenth), the sky cover is *clear*. It is *scattered* when they cover almost half the sky (between one-tenth and five-tenths). A *broken* sky is one which is more than half covered (between five-tenths and nine-tenths), and an



Mercurial barometer is simplest type. Normal pressure is about 29.92 in.

Aneroid barometer is built like altimeter.



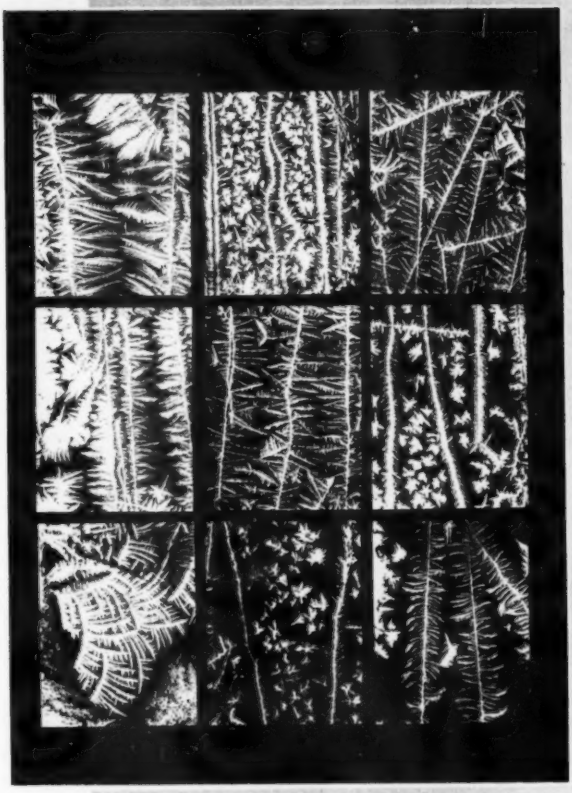
About one-fifth of our atmosphere is oxygen.

overcast sky is one almost completely covered (more than nine-tenths).

In the atmosphere there are other types of condensation besides clouds which have a great deal to do with our weather. These types are classed as *precipitation*. We are familiar with them; they are rain, freezing rain, drizzle, freezing drizzle, sleet and hail. All present hazards to the pilot because they mean poor visibility, low ceiling and icing conditions.

Dew is really another form of precipitation. It is the condensation of water on cool surfaces, such as grass on a summer morning, the outside of a container of ice water, etc. When this water condenses below the freezing point, it forms as *frost*, which we find in the autumn when the earth becomes very cold at night. Later we shall discuss the subjects of condensation and dew formation in more detail.

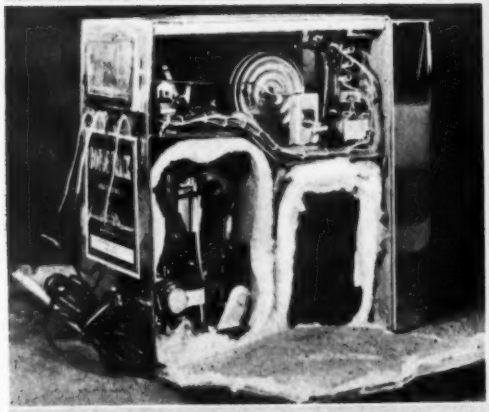
The instrument used for measuring precipitation is the standard rain [*Continued on page* 136]



Condensation, occurring on ground objects at temperatures below freezing, takes the form of small ice crystals frost, a familiar sight on winter windows.

The standard rain gage measures precipitation.

Photos Courtesy U. S. Weather Bureau



Upper air soundings are obtained by radiosonde.

IDEAS FOR SERVICE MEN

MOST MEN seem to gain weight on the Service grub, but just as in civilian life a few of the boys *will* be boys and overdo it, particularly around the midship section. Comes the inevitable day when these lads, getting dressed one morning, discover that the old belt is just a weeeee bit too short. Naturally they blame it on the belt—the damned thing must have shrunk from the dampness last night!

We don't say that Cpl. Earl L. Wellersdick, of the Redmond Air Base, Oregon, is necessarily in the above category, but the fact that he sent in an idea to alleviate the situation makes it at least possible. His solution (naturally) involves a workout—for the belt.

"If your belt," says Earl, "is getting too small for you, wash it thoroughly then stretch it around the cross-pieces of your bunk and buckle it there. When it dries you will find that it has been stretched considerably."

At ease, men.

WE THOUGHT we'd heard of all the uses for MECHANIX ILLUSTRATED besides its reading value (such as target backstops, gluing jig weights, etc.) but Pvt. Walter J. Holder, Niagara University, N. Y., has a new one that should make the mag more popular than ever among the armed forces. This is really good so we'll let Pvt. Holder tell you in his own words:

"Recently while polishing and pressing for a personal inspection I ran into the problem of getting the wrinkles out of the shoulders of

Identification tag holders of the type used on small luggage are useful cases for dog tags. They will keep the dog tags from rattling and prevent them from turning skin or underwear green. (Submitted by Pfc. David Chamberlain, Colorado Springs, Colo.)

my blouse, not having access to an ironing board. Every GI knows how easily those wrinkles get in there while on a week-end pass (now *what* can he mean by that?—Ed.) and I find that a back issue of MI does the trick. Roll the magazine tightly and place it in the shoulder. Then, by putting your hand inside the sleeve and a damp towel over the outside you can press out the shoulder smoothly."

PFC. ANTHONY DEMERAL, Niantic, Conn., has a suggestion that should interest WACS and WAVES as well as soldiers. To keep your collars neat without the use of stays, pins or an excess of starch, simply sew ordinary dress snaps on the underside near the tips. Mark snap positions with the shirt on and sew carefully. They'll give you that crisp appearance you want and stand up under many launderings.

THE NEXT IDEA is aimed at Air Corps men who have to do repair work on planes, but any Army maintenance man would undoubtedly find it of value. It comes from a war worker, George E. Miller of Lockheed, Burbank, Calif., and is illustrated in one of the sketches.

A very superior center punch can be made from a .50 caliber armor-piercing bullet. Cut the soft jacket apart, as indicated, remove the hard steel core and sharpen the latter on an emery wheel. Keep the soft case as a protective container for the punch.

SNAP FASTENERS come back into the picture on this one, sent in by Cpl. Darrell Roberts, who's at Camp Santa Anita, Arcadia, Calif.

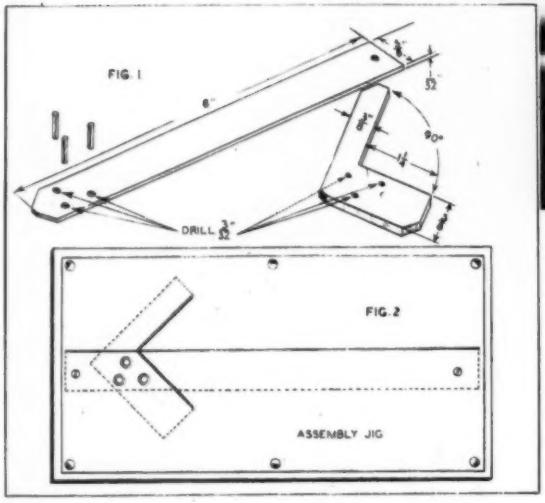
"I've noticed that the cooks in our messhall use a little stunt that is worth repeating.

"Since all their white jackets are laundered together and then picked out at random by their wearers, there is no rank or mark of recognition on them.

"So they have sewed snap fasteners on the jackets and on a set of their own stripes, and as they don a clean jacket each morning they merely snap their chevrons on the sleeve.

"Don't get the idea that our cooks are 'stripe-happy'—it's just for their own convenience and efficiency that they do it."

MODEL MAKER'S CENTER SQUARE



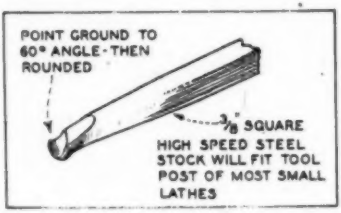
FOR those home-workshop fans whose shop boasts a lathe, this little gadget will aid in centering quickly the ends of shafts and rods for turning between centers. Lay out carefully, making sure angle of the V is 90°. To use, lay the blade across the shaft as shown and scribe a line. Then move the V about a quarter turn and scribe another line. Center is where these two lines cross.

Inside Boring And Turning

INSIDE turning and boring operations frequently bring disappointing results—and they aren't always the fault of the amateur mechanic, either! Obtaining a straight hole, free from taper, is the problem. The best procedure is as follows:

First run-in a small drill held in the chuck in the tailstock and follow with successively larger drills until the hole approaches the final size. Set the boring tool in the toolpost and adjust to clear the sides of the hole; proceed with relatively light cuts.

The illustration shows a boring tool cutter bit which will cut a smoother surface than the usual sharp-pointed tool, giving more accurate dimensions where precision is essential. Take the bit and grind it to a 60° point and then round it off as it would be for a Whitworth thread. The usual pointed bit actually cuts minute V-threads, resulting in a variation of measurement, depending upon whether the measuring instrument rides on top of these small threads or between them.



Always use the lathe's slowest longitudinal feed for boring. Take cuts of 5 to 15 thousandths going in, and not more than 1 or 2 thousandths coming out; *always* take a light cut coming out. If your lathe has a quickly reversible longitudinal feed, use the automatic feed both ways; if not, use it going in and hand feed it coming out—very, very slowly. When approaching final measurements, both "in" and "out" cuts should be very light, the last one an "out" cut to avoid tapering the hole.

Use camphor-turpentine mixture when boring in tool steel and drench thoroughly during every cut. For the burnishing cut, use machine oil.

When almost to dimensions, repeat "in" and "out" cuts changing cutter depth very slightly to burnish.

GAY 90'S CARRIAGES

MAKE INTERESTING MODELS

Grandpa and Grandma didn't have streamlined super-Cadillacs to run around in, but they managed some pretty snazzy vehicles. Here are two well-known types.

by Hi Sibley

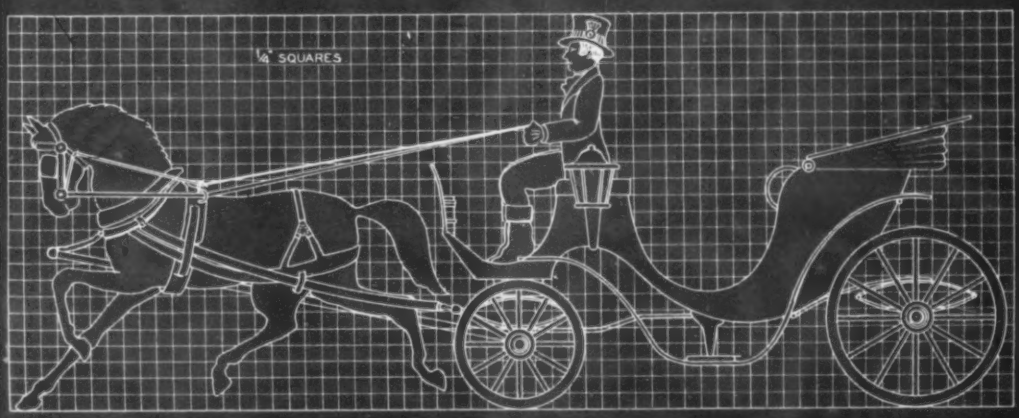
The swanky Coupe protected passengers from weather, let coachman and footman take the rap.

ALTHOUGH the present generation is familiar with all types of automobile bodies, few would recognize the carriages from which they took their names. The plans detail a Victoria and a Coupe, both of them very smart in the nineties; in fact you just had to be in the upper brackets to own either one.

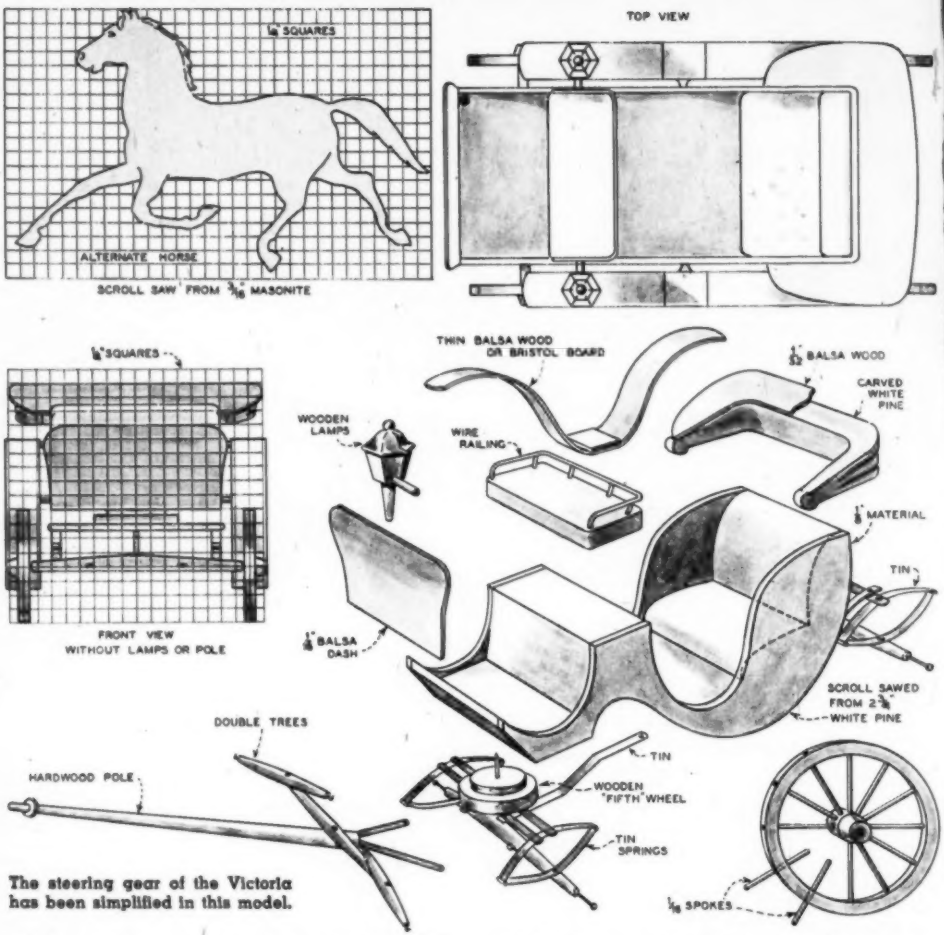
Victoria

The Victoria was usually driven by a uniformed coachman with a footman sitting stiffly at his side, the lady passengers in picture hats and beruffled gowns and at least one of them holding a tiny lace parasol. This carriage was used principally for drives through the park and, being open all around, displayed the occupants to good advantage and no doubt to their satisfaction. In case of a sudden shower the "cape top" could be raised to cover the ladies while the flunkeys were obliged to take the rain as best they could.

This model is not to scale but designed for the simplest construction by a novice and has been altered slightly here and there from the original lines for this purpose. The body is scroll-sawed from a block of white pine, as shown in the perspective drawing, and the sides are parallel. Seats are formed in this operation, and sides of ⅛" material are then glued on. A folded top is carved from a solid



Victoria was roadster of day, and gave occupants a chance to display their



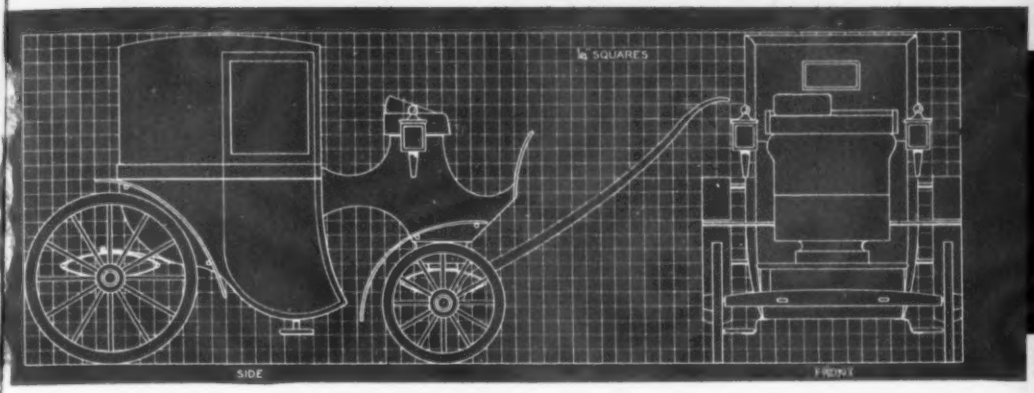
The steering gear of the Victoria has been simplified in this model.

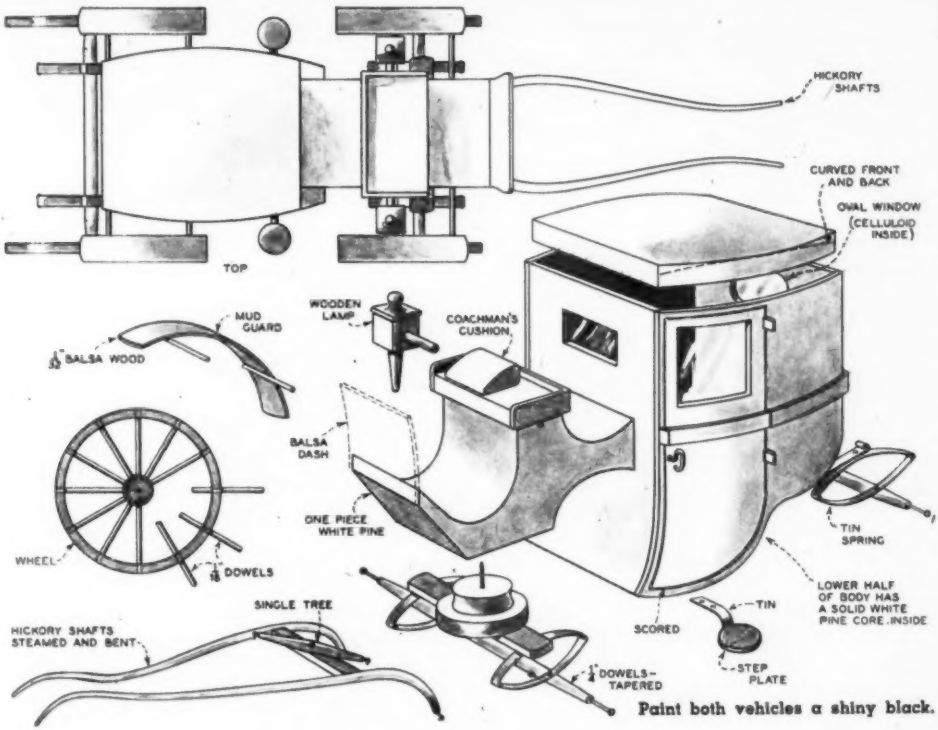
white pine block and a balsa fender is installed on it. This top fender was considered very smart and distinguished any carriage having it from the common buggy. The coachman's seat has a rail around it made from wire like that used in paper clips. Fenders are of thin balsa or heavy bristol-board and the step of sheet metal. It should be fairly substantial to retain the curve of the fender. Note in these models that carriage fenders are not only much narrower than on motor cars but rather skimpy, and yet adequate because of the modest speeds of the vehicle. Lamps are whittled from wood to a hexagon shape, the sides covered with tin foil and frames marked in black. The top should be black as well.

Running gear has been somewhat simplified from that on the prototype; the latter would require some very intricate soldering and bending of wire. Instead of the skeleton "fifth wheel" upon which the front axle turns we have designed a wooden-disk affair, with tin springs and a tapered, hardwood axle. The Victoria should be drawn by two horses, and these are scroll-sawed from plywood or masonite, with the harness painted on for simplicity. Details of the tongue and double-trees are shown in the perspective drawing. The all-wood wheels are made as described in the Austin Steam Car article, August, 1943, MI.

Coupe

The exclusive "coupe" is for ladies and gentlemen bound for the opera, receptions, or shopping. The name originates from its design—"coupe" or "cut down" from the longer coach or barouche with their four-





Paint both vehicles a shiny black.

passenger capacity, whereas this carries only two in addition to the coachman. In spite of its various curves the body is very easy to make. The top is a single block curved on the sides and also fore-and-aft on the top. The entire bottom, beginning just below the window in the door, is also a solid block scroll-sawed to the shape indicated, and over these pieces $\frac{1}{16}$" balsa are glued on four sides after cutting in door and window openings. Celluloid is glued on the inside of them. Door frame is scored and dummy hinges glued on. A handle is bent from paper-clip wire. Lamps are of wood, finished as in the Victoria model, and running gear is identical. One horse is used to draw this vehicle and shafts are steamed and bent from hickory.

Two horses in slightly different positions are offered so that in the team they will not be exact duplicates. However, they should be matched in color. Dapple grays were once a fad with a Victoria. This coat is achieved by stippled black spots on a white ground, very lightly tinted with gray.

Plaster Plaques
WITH CLAY MODELING

Clay modeling is one of the most fascinating of all crafts. Materials are cheap and little artistic skill is needed.

by Dick Hutchinson

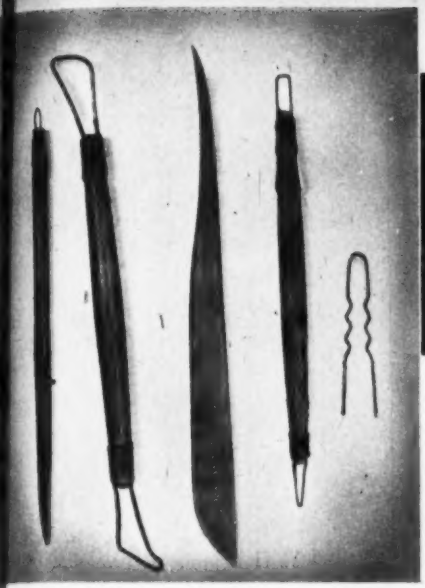
This plaque above has an antique finish.

THERE'S a bit of the artist in all of us and this is a hobby in which we can put that talent to use with satisfying success. For our material we need either some modeling clay, Plasticine which may be obtained at any store selling artist's supplies, or the wax composition sold at the local five-and-ten. Plaster of Paris will be needed, of course, and also a little shellac, a wire coat hanger and some oil paint. A piece of ¼" plywood of suitable size will do nicely as a base on which to do our modeling.

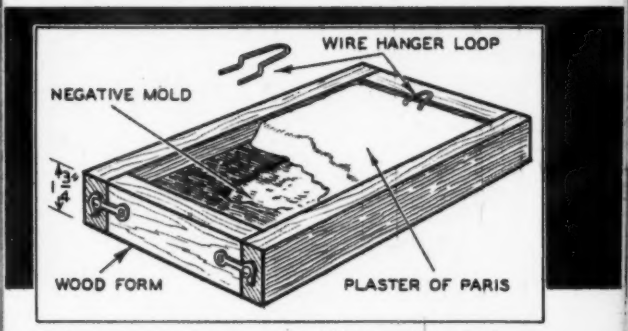
We can make our own tools from pieces of wire and hairpins, bent to shape and fastened to the ends of dowels. One dowel, whittled to resemble a knife, will do nicely for laying the clay in place.

Here's the method! Press a layer of clay, about ½" thick, evenly over

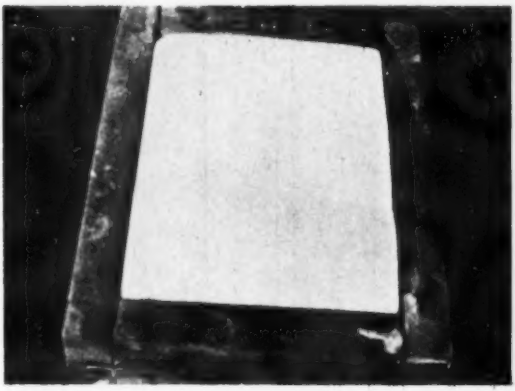
Cutout of "Dopey" is placed on clay, outlined with hairpin, detailed and then modeled.



Homemade tools will serve very nicely.



Make a frame as shown to hold the mold and plaster.



the modeling board. Cut out a picture of your subject, lay it on the clay and with a hairpin carefully hook the clay away from the picture to a depth of $\frac{3}{16}$". Next prick holes in the outline to indicate eyes, mouth and various other details, and mold the contours of the subject. Build a wooden frame and clamp it tightly around your model, and brush the clay carefully with motor oil to prevent the cast from sticking.

Into a pan of water, slowly sift the plaster of Paris, stirring continually until it is the consistency of pancake batter, and then pour the mixture into the form over the face of the model. The amount of mixture you will need will depend upon the size of your project. Rock the mold lightly to prevent air bubbles, and then let set until hard.

Remove the frame and [*Continued on page* 132]

Negative mold is made of plaster. Plaques are made from this and then antiqued or painted.

RECONDITION YOUR FURNITURE

IT'S easy to refinish and reupholster your furniture. Care and patience are about the biggest factors. If both jobs are to be done on the same piece, remove the old upholstery first, then refinish the wood parts.

When these are thoroughly dry, begin the new upholstery job. Start with new webbing on the bottom. This holds the springs which are sewed to it in the next step. After springs are in place, tie them with cord radially, as shown. Tack burlap over springs, lay on cotton padding to the proper thickness, then tack on muslin, then upholstery.

If you plan to refinish the wood and reupholster, too, sand the old finish off after removing old upholstery. Replace webbing on chair bottom, tacking on as shown after refinishing. Note that strips "weave" through each other.

At right the wire springs are being stitched to the new webbing. Chair wood has been refinished.

Above: New cord ties springs in place for the duration. It runs from tacks on wooden frame to top ring of spring, then to knot where cords join.

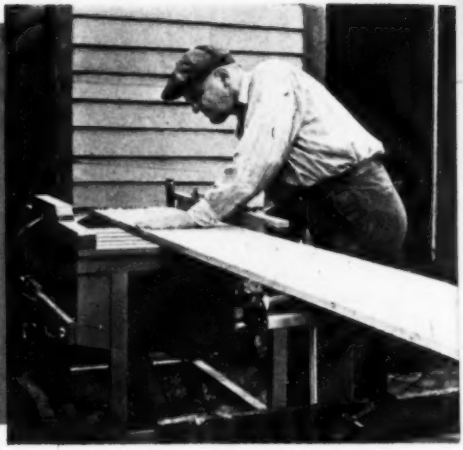
When springs are tied in place (tie on spring and center knot) you tack burlap covering over them. Rolled, stuffed burlap goes on some chairs.

Left: After burlap has been tacked over springs, and cotton padding laid on to proper thickness, the final upholstery can be applied. This should be folded under for short "hem" and tacked as shown. Use upholstery nails, tacks won't do.

CUT-OFF SAW

If your workshop isn't equipped with this type of power saw, why not treat it to one?

by Joseph Williams

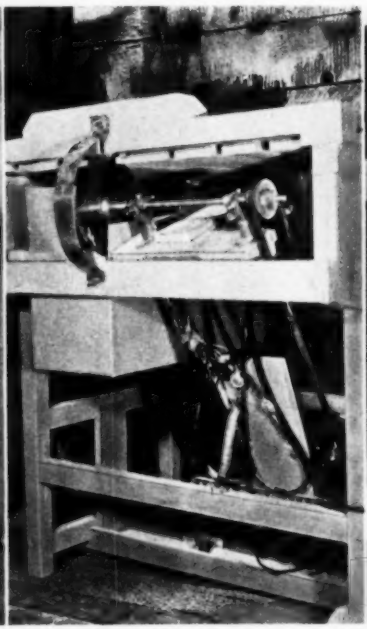


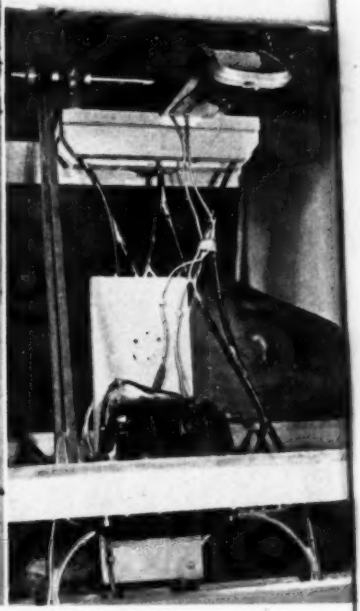
It can handle long stock with ease. Guard protects worker.

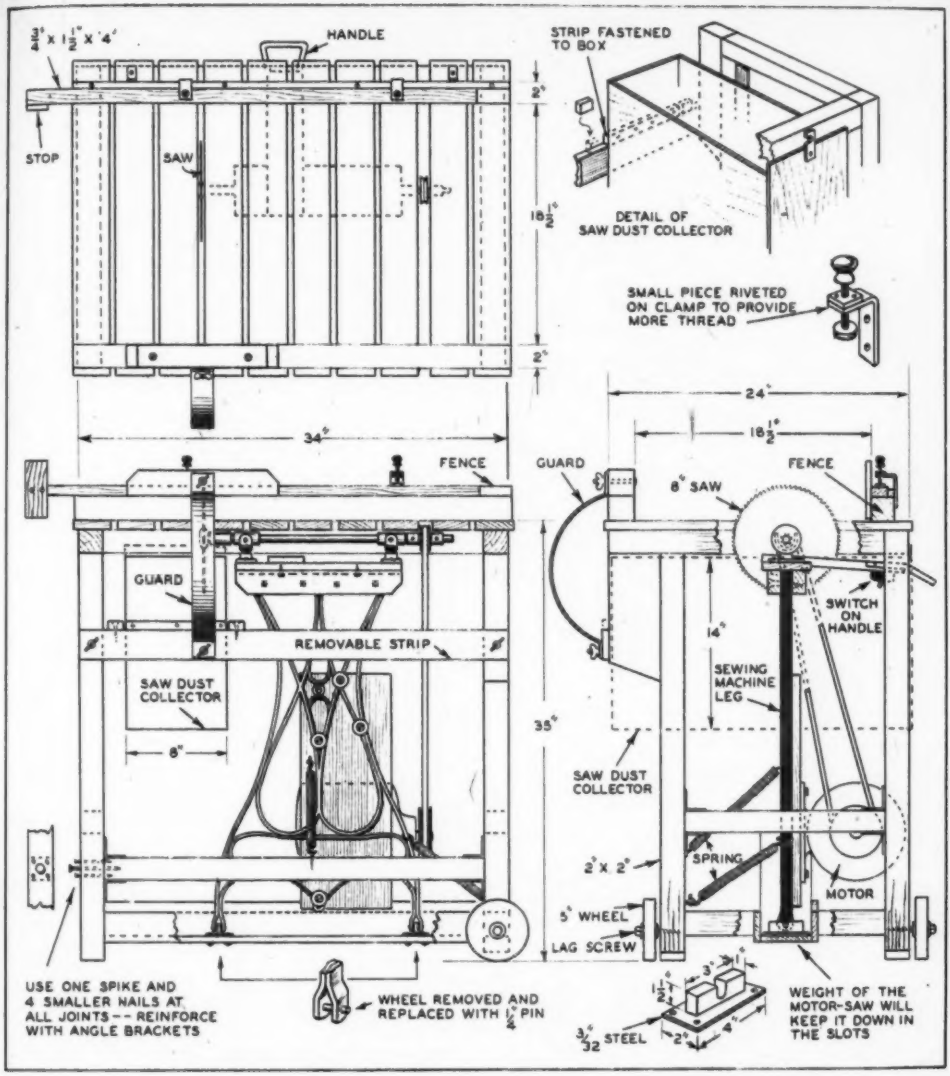
THIS valuable accessory can be made from those odds and ends of lumber which are lying around your workshop. It is just the thing for handling long stock and can take ¾" boards up to 18½" wide and 2" boards up to 14" wide, these lumber sizes being determined by the arc-swing of the saw.

The table itself is built of 2"x2" white pine while the top is made of ¾" scrap plywood. Joints of legs are reinforced with metal corner brackets. Use ¾" white pine for the bottom, and for the sawdust collector, plywood or thin

Saw unit is made from side of old sewing machine and can be carried by one person.

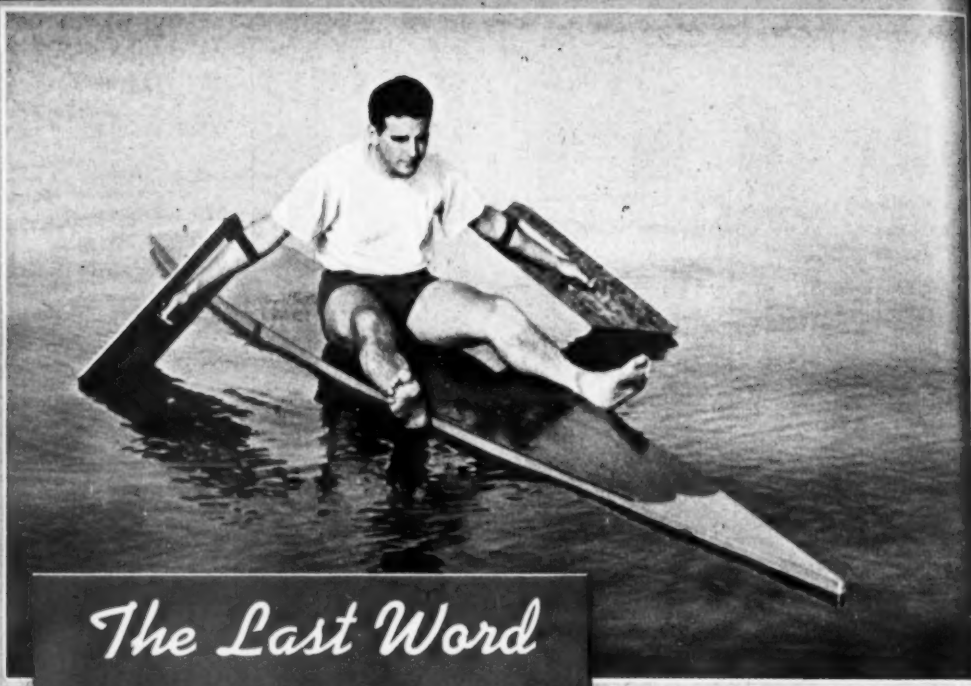






boards of 3/8" or 1/4" are suitable. This box can be made removable for emptying by building it with a supporting strip at the back and a turning hook at the front as shown in the diagram. The lower half of the saw is enclosed in the box for safety. The cut-off fence should be adjusted for exactly 90°, and if it is attached with clamps as shown, it can be used on either side.

Saw guard is a piece of 2" steel bent to cover the saw. Fasten with wing nuts for quick removal. The motor-saw unit is the leg of a sewing machine to which is attached a plywood board with a 1/4-h.p. motor bolted to it. To the top of the leg are screwed two wooden pieces as shown with a third strip on top carrying the 1/2" shaft, pulley and saw. Use a 1" spring to balance the motor. The wheels of the sewing machine are removed, the holes in the legs are rebored and 1/4" pins inserted. Pivot seats for these are made of steel and attached to the bottom board with 3/16" bolts. A length of narrow angle iron forms the handle, the motor switch being located next to it. To use, pull the saw through the work by means of the handle.



The Last Word in PADDLEBOARDS

Paddling backwards she'll do over 6 knots. For'd paddling is fast too, but more tiring.

by Albert Lloyd Brown

"IT CAN'T be a paddleboard," you hear someone say, "why, it's passing those sailboats; it's going by those other paddleboards in a breeze!"

The unusual performance of the "super" paddleboard can be attributed to a fast, stable design, ample displacement, small draft, and a new type paddling technique which places the strain on the forearms rather than the hands. Briefly this explains how performance is stepped-up to compare favorably with racing sculls.

Actual racing trials over 50 yards showed an average speed of over 7 miles per hour. This is almost 11 feet per second, or slightly over 6 knots. Why not complete this paddleboard with the special paddles, and beat this unofficial record?

Big enough to carry two, board is easy to handle.

A good place to sun yourself, or ride the surf. If you're ambitious, try Ha-

PAINT 3 COATS

DRAIN HOLE

¾" NO.6 BRASS FLAT HEAD SCREWS COUNTER SUNK

¾" WHITE PINE RIBS AND SIDES

⅛" TEMPERED MASONITE TOP & BOTTOM

¼" BRASS SQ. HEAD & NUTS MACHINE BOLTS COUNTERSUNK AND ENDS CUT OFF

2" NO.12 BRASS FLAT HEAD SCREWS COUNTER SUNK

DOUBLE RIB BOLTED

TOP & BOTTOM JOINTS PLACED ON DOUBLE RIB

6" 7' 7' 10"

DRAIN HOLE

12" 12" 12" 12"

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

¾" 3⅜"

3'6"

STATIONS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
WIDTHS	13 5/16"	16 5/16"	19 1/16"	21 1/4"	22 1/4"	22 7/8"	22 7/8"	22 1/4"	21 1/4"	20 5/16"	18 7/16"	15 5/16"	12 3/16"	8 1/16"	4 1/2"	1/4"
½ WIDTHS	6 5/16"	8 5/16"	9 1/32"	10 5/8"	11 1/4"	11 1/32"	11 1/16"	11 1/32"	10 5/8"	10 5/16"	9 5/32"	7 5/32"	6 1/32"	4 1/16"	2 3/8"	7/8"

15½" 1½" 6½" 3½" 4" 3" 9" ¼" PLYWOOD HANDLE SPECIAL PADDLE 26¾"

Here the man paddles backwards while feminine member of crew paddles forward—watching course.

Crew faces aft for a fast trip. You'll probably set your speed record this way.

To start building your paddleboard ask your lumberman for 1"x4" lumber for the sides. He will give you a ¾"x3⅝", which is the finished size. For convenience in building, use this finished size.

Lay two pieces of masonite end to end on the floor or cement walk. Draw a center-line with the aid of a stretched string. Mark along this line the position of each rib. With a triangle draw all the rib positions. Do not rely absolutely on the half width measurements. Fair in the side curve by bending a long strip to touch the measured width points. Lie on the floor and look down the curve from each end. When the curve appears correct, a pencil line on each side of the ¾" bent side-piece completes the lay-out. Since the plan view of the paddleboard is symmetrical, the other side is made exactly like the first side; measure from the center line out on each rib to the faired curve, and transfer this measurement from the center-line out on the other side.

Notice that the one foot rib spacing is from the butt joint at the double rib to the near side of the ribs in each direction. Don't cut the side pieces to correct length until the frame is nearly completed. Measure off the distance in which the side pieces taper up toward the front, draw a curve with the aid of a flexed stick or batten, and cut out on saw-horses starting from the end—prow or stern. Saw along the curve until the saw gets so near the edge that it breaks through. Knock off bump at this point with a plane. Clamp the two side pieces together, lay on a saw horse, and plane both together to make a perfect match. Cut all except the narrower nose ribs from the same width of material as the sides. The nose ribs must be cut down to accommodate the lift toward the front. Take the length of the ribs from the layout on the masonite, being careful to mark the bevel of the ends to assure accurate cutting and eliminate tiresome planing and trimming. Drill drain holes and saw out wood between holes.

Build the paddleboard upside down so that a weight may be placed on the nose to keep the center batten to the proper curve. Lay pieces on the masonite layout. Slide center line battens into rib notches. Beginning with the widest ribs apply Cascamite waterproof glue. This powdered glue, when mixed with water, looks like icing, and dries to a glass-like hardness which can hardly be chiselled.

Place the ribs between the side pieces, and with the aid of as many clamps as you can borrow, clamp the ribs tightly to the side pieces. Most clamps should have a two foot expansion; construction will be difficult without at least four [*Continued on page* 132]

TRANSPARENCY VIEWER

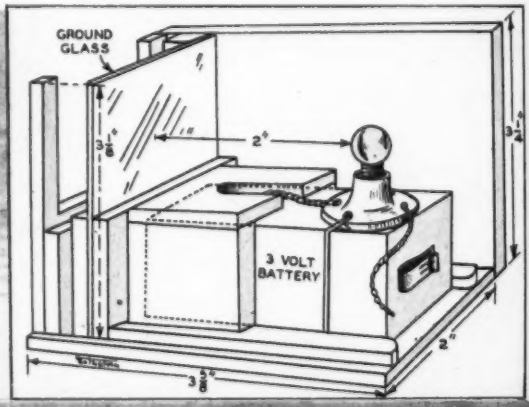
ONE cigar box, a 3-volt battery and bulb, a small porcelain socket and a piece of ground glass make up this simple viewer for your Kodachrome transparencies.

The housing, which is cut with a hand jig saw, contains a compartment for holding the battery, a support for the glass and a built-in slide holder. The bulb is centered exactly with the transparency, the distance from the bulb to the glass being 2″ in order to produce diffused light.

The glass is cut to a size of 2″x3⅛″ and one end is sandwiched between two pieces of wood, each 2″x1⅛″ in size, the projecting upper portion of the glass then measuring 2″x2″, the size of a mounted transparency. The polished side of the ground glass faces the front of the viewer. The inside measurement of the front frame is ½″ smaller than the slide, and the top cover has a slit cut in it 2 1/16″ long and ⅛″ wide for taking the slides. A small block of wood ⅜″ wide is glued to the inside of each wall to rest against the glass, leaving an opening on the front side which forms a recess for holding the slides.

There is no wiring attached to any part of the housing, and no soldering is required. The rectangular battery is only 2¼″x1⅛″x1⅛″ in size, and can be obtained at radio supply stores. If none are available, use two flashlight batteries connected in series. The small porcelain socket and bulb you can get at the 5 & 10. The socket is attached to the battery with a fine wire which has been hammered flat. One copper wire connects the lamp-socket with the battery, and a steel wire is attached to the opposite side of the socket. The end of this wire is looped and then bent slightly so as to act as a spring; this loop makes contact with tin contact when back cover is closed.

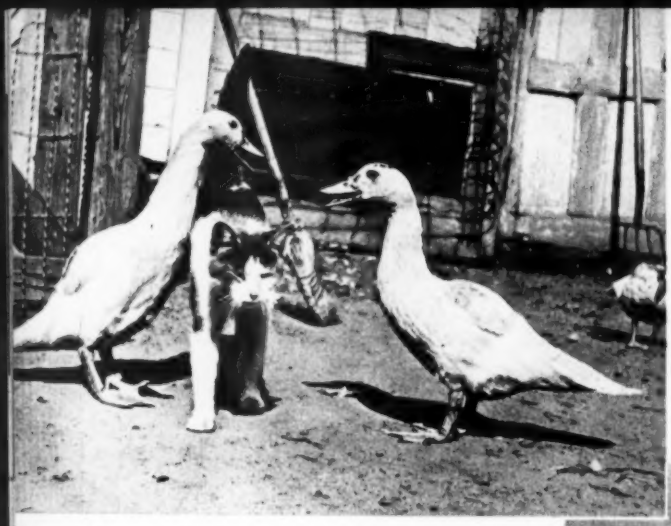
You'll like this handy viewer for your Kodachromes.



Tin strip on rear cover connects battery to bulb. Use flashlight cells if large one isn't available.

PHOTO CONTEST.

FIRST PRIZE ($10.00): Peacemaker? by Crawford Robbins of Detroit, Michigan. **SECOND PRIZE ($5.00):** Riding High, by Sgt. Wesley I. Reid of Fort Knox, Kentucky. **THIRD PRIZE ($4.00):** Sky Show, by C. W. Myers of Dayton, Ohio; taken with a Wratten "A" red filter. **FOURTH PRIZE ($3.00):** Chicago At Night, by Tony Rizzo of Chicago, Illinois.



▲ 1st PRIZE

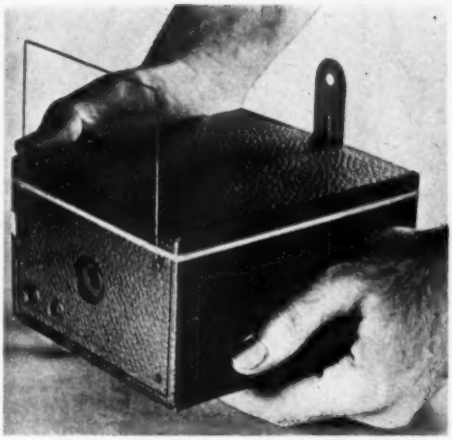
2nd PRIZE ➔

▲ 3rd PRIZE

Submit contest prints unmounted—no larger than 8x10 inches. With each print list camera, film, lens opening and shutter speed, illumination and developer. Write your NAME and ADDRESS on the back of each print and wrap securely with cardboard or corrugated stiffeners. ENCLOSE POSTAGE for the return of unused prints. Published prints cannot be returned. Address: Photography Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York 18, New York.

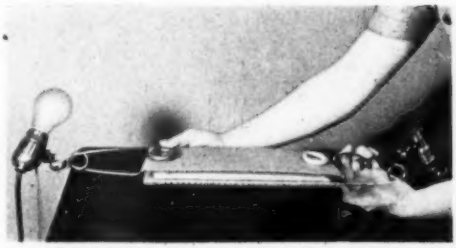
4th PRIZE ➔

PHOTO KINKS



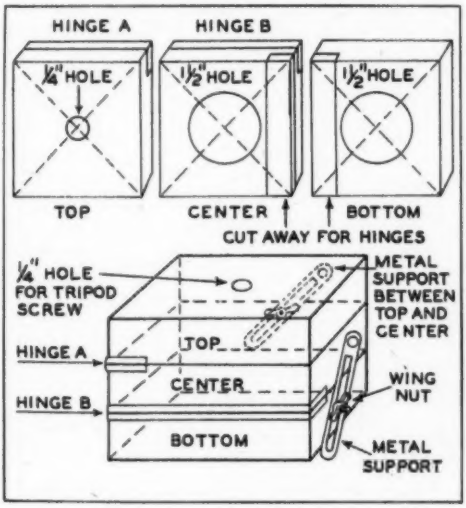
ACTION FINDER: A box-camera action finder can be made from a wire frame and a cardboard peep sight. Fasten with a rubber band.—Robert Scott.

ENLARGEMENT SIZE: Your enlarging can be simplified by marking the enlarger upright at each setting with the number of diameters a negative is enlarged. Use India ink or iodine.—A. J. Lockrey.



FLATTENING PRINTS: In an emergency, flatten prints by placing them between corrugated cardboard, held with lighting-unit clamps.—L. Hochman.

TRIPOD TILT-TOP: This two-way top allows your camera to be tilted sideways, forward or both. Use piano hinges for blocks and mount top to tripod permanently. See diagram.—R. Eichberg.



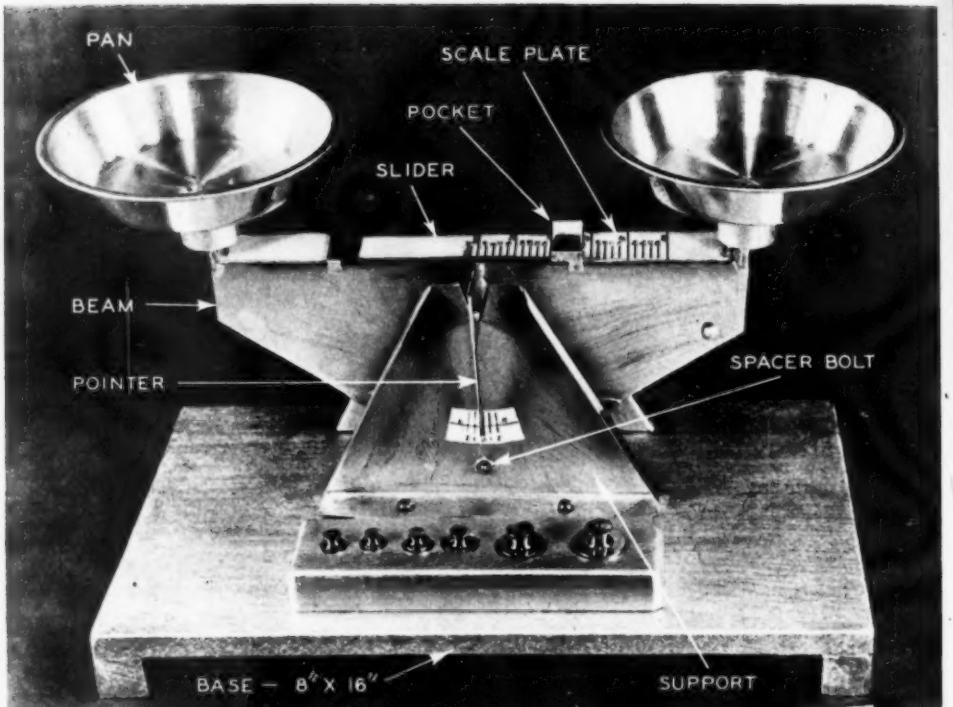
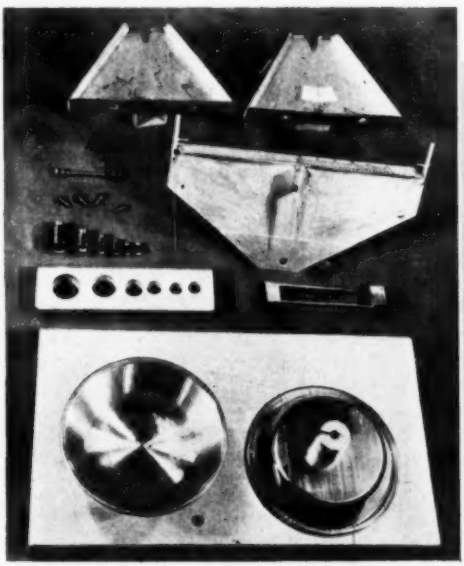


PHOTO CHEMICAL SCALES

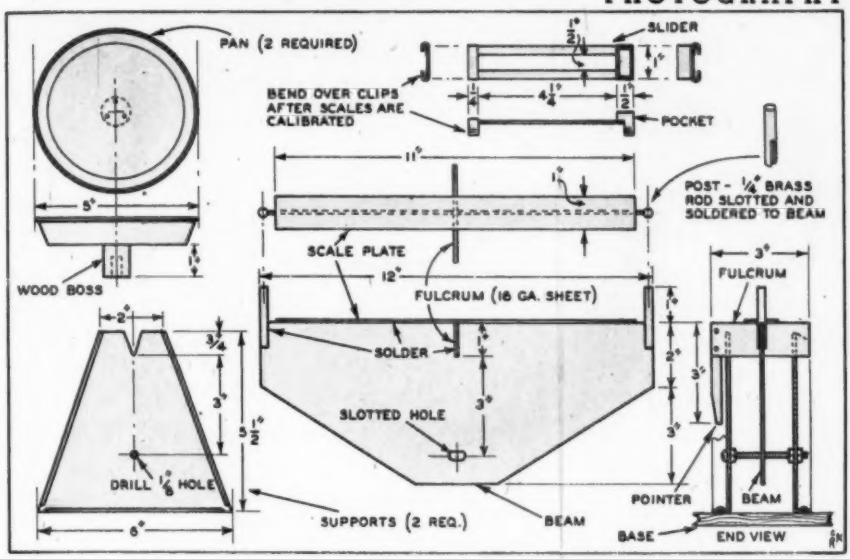
by Jack Mellinger

A GOOD set of photo scales is practically a "must" in any well-equipped darkroom, but like most photographic accessories, such a set is very hard to get at the present time and the price is high when one *can* be located. It's not difficult, however, to make your own, and the outfit shown here is the successful result of several experimental designs. The only thing you'll have to buy is the weights, which shouldn't cost more than a dollar or two.

Using the tin sides of a 5-gallon gasoline can, the various parts can be cut out as shown on the drawing. No extreme accuracy is necesssary except in the mounting of the posts that hold the two pans. These posts should

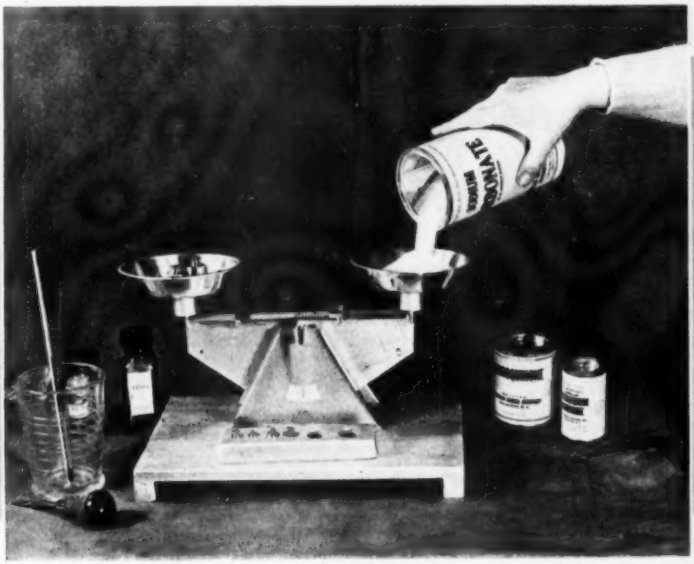


The only thing to buy for this photographer's scales is a set of weights. Cut all the parts from a tin can.



be equidistant from the fulcrum. They are ¼" brass rod, 1½" long, slotted with a small hacksaw and soldered upright in place. The fulcrum is a piece of 16-gauge roofing iron, likewise soldered in place, with the bottom edge filed to knife sharpness. All the rest is made from the can sides.

The scale plate is soldered in place with the beam turned upside down on a block of wood, using a small electric iron and soldering the entire length. The slider looks difficult to make but really is quite easy. It has a pocket in one end and in the pocket, pieces of lead are placed to overbalance the beam. The rest is made long so the whole arrangement will slide well and won't bind on the scale plate. This slider is a 1"x5" flat piece with a ½"x4¼" window cut out of it. On one end is soldered a pocket about ⅛" deep and on the other end is fastened a plain [*Continued on page* 134]



Small pie tins are used for pans. A slide moving over a calibrated scale plate adjusts balance for measurement in grains.

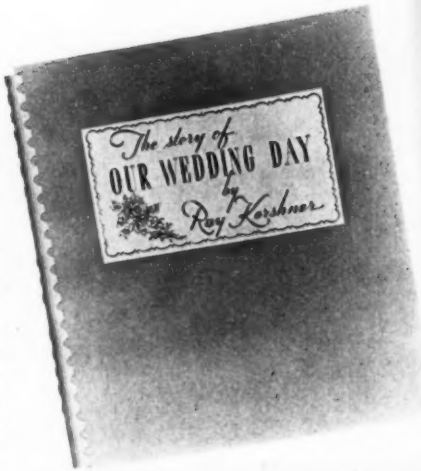
De-luxe album costs more but lends itself to best artistic treatment. Photos are mounted on heavy art paper with hand-drawn borders around them. Pages are separated by parchment paper. Cover is heavy, embossed; binding plastic or spiral.

Story in Pictures!

PERSONALIZE YOUR PHOTO ALBUMS

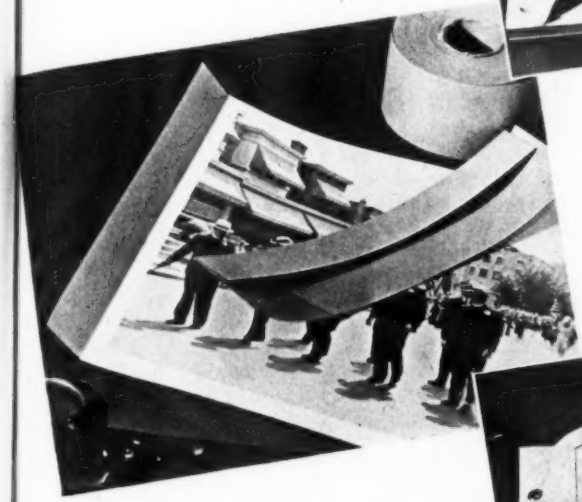
THE problem of properly storing pictures taken during travels, picnics, outings and special events is one that requires thoughtful consideration. Will you just toss those pleasant memory reviving photographs in a drawer to become soiled and forgotten, or will you mount them carefully in a styled album so that you and your friends may live over again the enjoyable times shown?

It is not necessary to purchase a factory-made photographic album to hold your prints. Original and distinctive albums are so easily made that you can have a separate album for each trip or event you picture. These albums, or photo files, can be as plain or as elaborate as you wish, and they can be individualized to express your personality or that of the event they contain.



Simplest album is used to keep small prints. As many pages as needed are used, and finished album is bound with wire staples, which may be covered with strip of contrasting colored scotch tape.

More elaborate is next album, bound with round-head fasteners through punched holes in margin. Cover and back are heavy art board, cut one-half inch larger than pages.

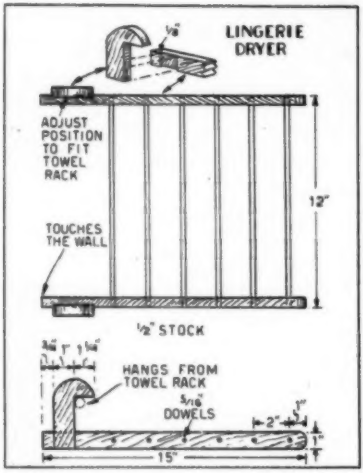


Reinforced gummed paper hinges are attached to large prints, which form full page, or smaller prints may be "laid out" magazine fashion and pasted to manila paper pages.

Finished album, bound with brass fasteners. Cover may be simply titled, right, or decorated with a picture, or decalcomanias.

Sterilizing Bottles

BABY'S nursing bottles can be sterilized quickly and efficiently by slipping them over the end of a funnel which has been inverted in a pan of boiling water. The funnel concentrates the steam which will rise through the end into the bottle and sterilize it in a few moments.

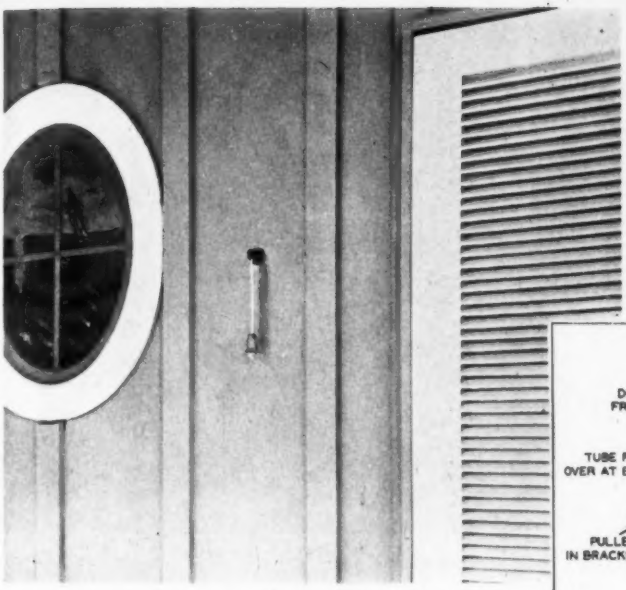


Lingerie Drier

JUST hook this drier over a towel rack and it will hold lingerie, stockings, etc. Six 12" lengths of dowel are glued into two sections of ½" x 1" x 15" stock. Hooks are sawed from ½" stock and fastened with screws to the side sections in grooves provided for them. The hooks are placed so that when they fit snugly over the hanger, the ends of the side sections touch the wall, keeping the drier rigidly in position.

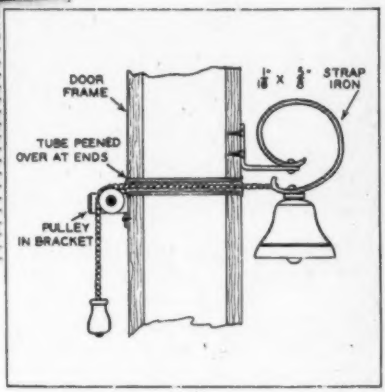
To Empty Polish Cans

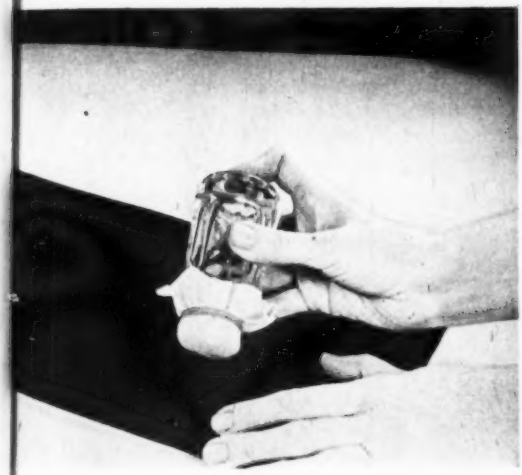
WHEN a can of automobile or furniture wax is nearly empty, there is always a ring of polish remaining on the inside which is hard to get. If you heat the grill of your gas burner, turn out the gas and then place the can on top, the wax will melt. Tip the can and wax will run to one side where you can get it when it has cooled.



Novel Bell

THIS unusual doorbell is easily installed and will not get out of order. Weather will not affect it. A sash-cord pulley may be used if a smaller one is not available, and a sheep- or cowbell may be purchased from a mail-order house. Follow sketch below.





"Spotter" For Cleaning

FOR removing stains from clothing, use this "spotter" made from a salt shaker. Fill with cleaner, place cotton wad over top, and tie on some white cloth. Invert shaker and rub on spot.

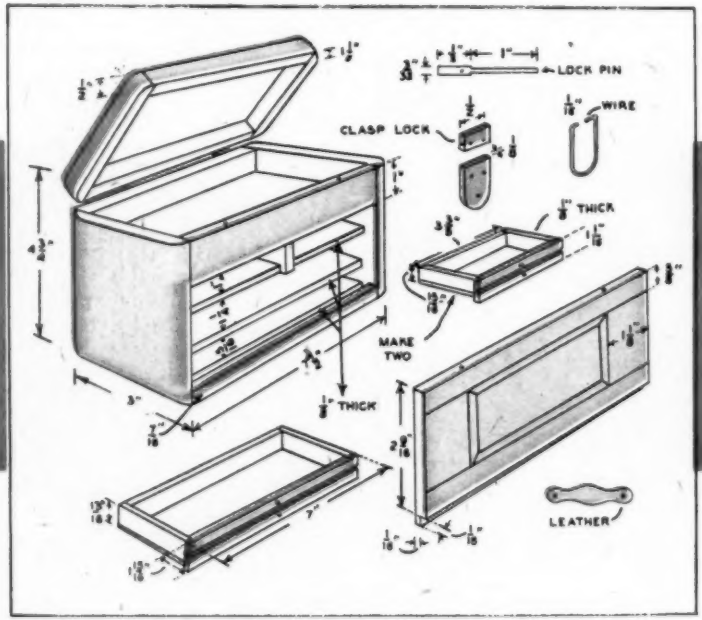
Making Artificial Flowers More Realistic

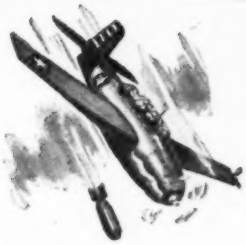
YOU can apply a little psychology to your vase of artificial flowers and make them appear much more realistic by scattering a few artificial petals around the base. These will give the impression that the flowers are shedding, as would be the case with real blooms in a warm room.

This chest, patterned after its big brother, will hold pipes, smokes and matches.

MACHINIST'S CHEST IN MINIATURE

THIS little item will appeal to every mechanically inclined smoker. It will hold all your smoking materials and the top can be fitted with fireproof material to make an ash tray. The chest itself is made of ¼" oak and the drawers of ⅛" pine. The bottom space is for the front cover to slide into when the chest is open. Glue all joints and use nails where they won't show. As in machinists' chests, two pins, forced down by the top cover, lock the front cover in place. Miniature hardware can be made from metal scraps.





Little Motor with a BIG LOAD

Lashed snugly to a pneumatic life raft, this big Navy bomb securely travels another lap on its journey to the enemy. It's capable of sinking a warship . . . blasting a strategic runway . . . or sending a munitions dump hurtling skyward. It packs a shattering thousand pounds of lethal devastation . . . but it doesn't mind being "pushed around" by a 33½ pound outboard!

For this small Evinrude, and for many other Evinrudes serving the Army, Navy, Marine Corps and Coast Guard, such tasks are all in the day's work! America's amphibious operations around the globe require huge fleets of boats, and Evinrudes are used to power thousands of small craft of every type. Specially developed Evinrude "Lightfours" drive huge rubber boats used in rearmament service, and for landing operations through heavy surf. Husky Evinrude "Speeditwins" help build pontoon bridges, power ferries, transport troops and armored equipment. Great Evinrude Storm Boat Motors drive swift assault boats at racing speed.

More than 30 years of experience, skill and engineering research are being centered on building still finer motors for our fighting forces. You can be sure that the peacetime Evinrudes to follow will be worthy successors of the fighting Evinrudes being built today!

EVINRUDE MOTORS, Milwaukee, Wisconsin

Evinrude Motors of Canada, Peterboro, Canada

Official U. S. Navy Photograph

BACK THE ATTACK . . . BUY MORE WAR BONDS

All-Wood Drill Press

[*Continued from page* 98]

of parallel, scroll-sawed members of oak, Fig. 8, and in the assembly view, Fig. 9, are shown the strap-iron over the ends as well as short pieces of scrap brass tubing serving as bushings for the bolts. A sash weight is used for a counterweight, and moves in a housing to prevent its swinging about. In this view are shown the built-up blocks from which the pulleys are turned, as well as finished pulley, key and sleeve. For the motor pulley, bore will be adapted to the armature shaft.

Make the base, which also serves as table support, of oak and the table of the same material, well bolted throughout and also bolted down to the work bench.

Very satisfactory wooden bearings can be used in place of the babbit ones. These should be orange or lemon wood, thoroughly seasoned, and a suggestion for boring with a bar on the wood lathe is given in Fig. 10. A jig should be made to carry the drill press frame along the lathe bed as it is pushed against the cutting tool. After boring the wood should be soaked several hours in oil mixed with flake graphite.

Refectory Table And Chair

[*Continued from page* 101]

others. The dimensions given here are for the regular chairs, all of them having unusually high backs. As can be seen from the perspective drawing, very little so-called cabinet work is required, being confined to the mortise-and-tenon joints at the upper ends of the legs. Elsewhere assembly is with screws and dowels as described above.

To achieve the appearance of age, the wood can be roughened with chisel, gouge and adz, and finished with stain and wax. A dark stain should be used. For a smaller and lighter table, simply reduce the dimensions.—*Hi Sibley.*

Plaster Plaques

[*Continued from page* 113]

separate the cast from the model. Put aside in a safe place and let dry thoroughly for a week, and then brush the cast completely with two coats of white shellac and let dry.

Now you are ready for your first cast. Place the mold in the frame as you did with the model, coat with oil and mix and pour in the plaster. Place a wire hanger loop in position, let set until hard, remove the frame and separate the plaque by tapping gently with a stick. Take care not to chip either piece. The plaster, in drying, will absorb any traces of oil remaining on the face. Let dry thoroughly as before.

Antiquing of plaster casts is a simple process. Brush the plaque with two coats of white shellac and then with a coat of burnt-amber oil paint thinned with turpentine. Wiping gently with a soft cloth will remove the excess paint.

Last Word In Paddleboards

[*Continued from page* 120]

clamps. Check ribs to see that they don't slide above or below the side pieces. The two inch screws are not inserted until all ribs are glued and held with clamps. Clamps are placed next to rib positions, *not on* them. Always place scrap wood between the frame and the clamps; this protects the surface. At this time saw side pieces at the rear end to a long bevel to fit together snugly. When all ribs are placed and dry, lift the whole frame off the masonite layout which has been on the floor, and place it on two sawhorses.

Begin inserting 2" screws to hold ribs to side pieces. Remove one clamp at a time (from a position beside a rib) placing it at a new position needed, rather than laying it aside. Countersink two machine bolts which secure the pointed stern.

When all screws are in, cut the 2"x6" nose piece to shape, and taper with a plane. Drill the slanted drain holes and cork holes so that they meet at one point. Gouge out a cup or shallow funnel at the rear of the block to better catch the draining water. No water has ever drained out of the original board due to its watertight qualities. Don't use any kind of stopper which won't float.

Plane or cut all excess glue from top and bottom, and try to get smooth, flush-fitting joints throughout. Lay the two masonite pieces (which were not used for the layout) on the top surface of the frame, mark with pencil around the edge of the frame on the under side. Cut out on sawhorses starting with the narrow end. Paint inside of each sheet with 2 coats of varnish.

Cut a piece of cheese-cloth into ¾" strips, doubling the material several times before cutting. This obtains a long strip with a cut of a few inches. Apply enough glue to adhere one strip of cheese-cloth at a time. This binder helps to make the board watertight. When one-half of the upper surface is finished, apply a coat of glue over the cheese-cloth, place the masonite sheet on this part of the frame, and squeeze tightly to frame with clamps.

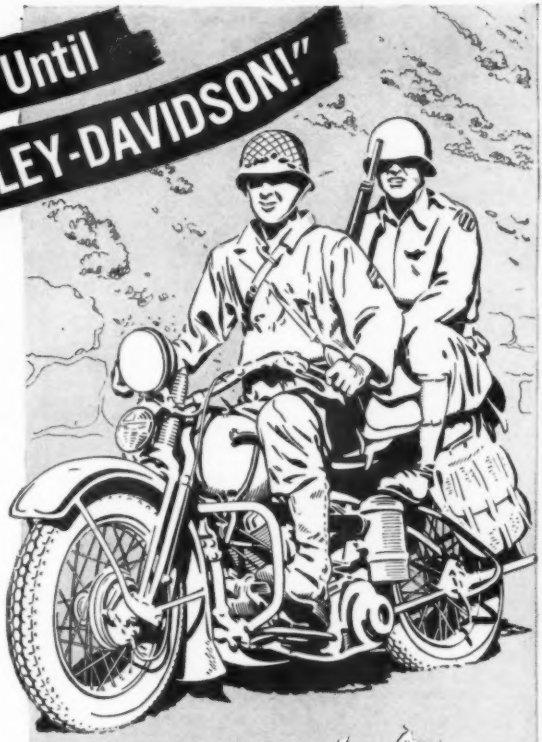
Drill pilot holes of proper diameter for the screws. Countersink holes and insert screws. Attach the remaining masonite sheets in the same way.

When all have dried, round the corners of the masonite with a plane and sandpaper. Be sure and mark the drain hole when you cover the upper side of the nose. Sand whole board, and chip off any glue which stuck to the layout board (which was used for the bottom).

Give the board two coats of varnish outside for a finish. Paddles are made from ⅜" plywood as shown.

Even normal persons don't hear all sounds in speech, so much of our hearing is guesswork based on knowledge of vocabulary.

"I Can Hardly Wait Until I Get My New HARLEY-DAVIDSON!"



On all battle fronts, the mention of "home" brings fond memories of happy motorcycling days to many a lad, just like this fighter in a certain Fleet Air Wing.

"I've always owned a motorcycle and I intend to purchase a new Harley-Davidson after the war. Harley-Davidsons sure stand up under all strains. They take all the punishment the Army gives them, so they're good enough for me. They really are tough — I can hardly wait to get my new one!"

That's from an actual letter by a rider named Al—one of the many thousands who are yearning for the fun of endurance runs, hillclimbs, gypsy tours and race meets. And when those "good old days" come again, war-proved Harley-Davidsons will be better than ever!

Put your fighting dollars into War Bonds — thrill to *your own* Harley-Davidson after Victory!

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Please send at once free copy of 24-page "Enthusiast" Magazine, filled with motorcycle action pictures and thrilling stories.

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FREE!

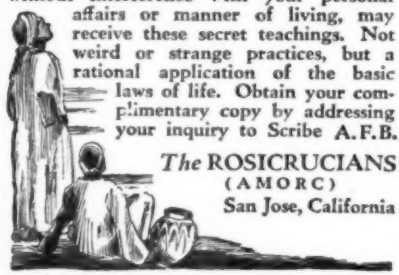
A SECRET METHOD FOR THE MASTERY OF LIFE

WHENCE came the knowledge that built the Pyramids? Where did the first builders in the Nile Valley acquire their astounding wisdom that started man on his upward climb? Did their knowledge come from a race now submerged beneath the sea? From what concealed source came the wisdom that produced such characters as Amenhotep IV, Leonardo da Vinci, Isaac Newton, and a host of others?

Today it is known that they discovered and used certain *Secret Methods* for the development of their inner power of mind. They truly learned to master life. This secret art of living has been preserved and handed down throughout the ages and today is extended to those who dare use its profound principles to meet and solve the problems of life in these complex times.

This Sealed Book -- FREE

Has life brought you that personal satisfaction, the sense of achievement and happiness that you desire? If not, it is your duty to yourself to learn about this rational method of applying natural laws for the mastery of life. To the thoughtful person it is obvious that everyone cannot be entrusted with an intimate knowledge of the mysteries of life, for everyone is not capable of properly using it. But if you are one of those possessed of a true desire to forge ahead and wish to make use of the subtle influences of life, the Rosicrucians (not a religious organization) will send you A Sealed Book of explanation without obligation. This Sealed Book tells how you, in the privacy of your own home, without interference with your personal affairs or manner of living, may receive these secret teachings. Not weird or strange practices, but a rational application of the basic laws of life. Obtain your complimentary copy by addressing your inquiry to Scribe A.F.B.



The ROSICRUCIANS
(AMORC)
San Jose, California

Photo Chemical Scales

[*Continued from page* 125]

straight strip. Both the pocket and the strip extend so that the ends can be turned underneath the scale plate after the scales have been calibrated.

The pans are ordinary small 5" pie tins, each being nailed to a wooden boss with three brads. This wooden boss has a hole drilled through the bottom which just fits over the ¼" post on the beam. The supports are made as shown, and the last item is a spacer bolt made out of 3/32" rod 2¼" long with double nuts at both ends. Any wooden base will be satisfactory, but a ½" board, cut 8"x16" and glued to 1"x1" blocks at both ends, will give a non-warping base.

To assemble these scales, mount the supports in the center, 2" back to back. Next, put the beam in place so the fulcrum fits down in the slot, and fasten the spacer bolt. The beam has a slotted hole for it, the length of this slot determining the amount of movement in the beam. Put on the pans and the slider with the left-hand edge of the pocket just over the fulcrum. This left edge is going to be the zero mark on your slider. Cut a piece of white typewriter paper 1" wide and 5" long and mark it off in 50 divisions, indicating grains. Glue it to the right-hand half of the scale plate with the zero directly over the center of the fulcrum, and over the entire scale plate fasten a piece of thin celluloid, using movie-film cement. Now you have a smooth top on the scale plate, and the slider can be put back in place at zero. Balance the scales by adding more weight to one side of the beam. Looking at the photo, you will notice that a bolt was placed through the right-hand side of the beam below the pan and filed off until the beam was balanced.

Now for balancing the pocket. Put a 50-grain weight in the left-hand pan and move the slider over until the zero or left-hand edge of the pocket is on 50. Add little bits of solder or lead in the pocket until it almost balances. Use hot candle wax to hold the pieces of lead in place; in this way the beam can be adjusted easily by adding or removing the wax. We now have balanced at 50 grains and there are 50 marks on the slider scale. Each mark, therefore, represents one grain. Check your scales by comparing with a manufactured set. Your druggist will be glad to measure out five 10-grain packages of a chemical which you can use to check each 10-grain division on your slider scale. If they don't balance exactly, you can remove the celluloid and put in another piece of paper strip, recalibrating it to each 10 grains. For a professional touch, a pointer can be placed on the outside edge of the fulcrum to show the out-of-balance position of the beam.

These scales must be handled delicately; they must not be jarred. The fulcrum has a knife-edge and any injury to this edge spoils the delicate movement.

TODAY...over there

here and I am enclosing it for you. Boy is it a honey?. I think I'm getting better with every shot. If a guy only had enough time left over from this war business, I bet I'd be taking some prize winners! Put this with the rest of the

TOMORROW...back home

FAR MORE PRICELESS SUBJECTS AND FINER-THAN-EVER CAMERAS TO TAKE THEM WITH! Yes, soldier! When there is "time left over from this war business," *everybody* will take better pictures. Until then we are working 24 unceasing hours a day to produce fine optical instruments for the armed forces. But thanks to new methods pioneered in making instruments of highest precision for war, Universal can promise after-Victory cameras and photographic equipment of excellence hitherto undreamed of.

BUY MORE WAR BONDS

EXPECT YOUR NEXT NEW CAMERA TO BE A UNIVERSAL

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UNIVERSAL CAMERA CORPORATION NEW YORK · CHICAGO · HOLLYWOOD

Peacetime Manufacturers of Mercury, Cinémaster, Corsair Cameras and Photographic Equipment

[*Continued from page* 105]

gage. All kinds, including hail, snow, etc., are measured on the basis of the actual depth of water they form when they have accumulated in the gage, the unit of measurement being the inch. The ratio of snow to water usually is taken as 10:1; 10 in. of snow make 1 in. of water.

The two behind-the-scenes directors of our atmosphere-stage are *temperature* and *pressure*. Their interaction is responsible for clouds, fog, precipitation, winds, storms, and just about everything else which comes under the classification of weather.

Temperature is defined as a measure of the hotness or coldness of an object or gas, and the instrument for measuring it is, as you know, the *thermometer*.

Atmospheric pressure is the weight of a column of air extending from the surface of the earth to the outer limits of the air ocean. If we could take such a column 1 sq. in. in cross section and place it on a scale, we would find its weight to be about 14.7 lbs. under normal conditions. This is our normal atmospheric pressure: 14.7 lbs. per sq. in. The *millibar* is a unit of pressure used on weather maps, in this case normal atmospheric pressure being about 1,013 millibars (mb.). Air pressure is measured by means of a *barometer*, the simplest type being the mercurial barometer designed by Torricelli. In this instrument a long glass tube, sealed at one end, is filled with mercury and then inverted over a dish of mercury. The liquid will adjust itself to a height in the tube dependent upon the atmospheric pressure, the mercury column being balanced by the air column previously mentioned. In other words, if our mercury column is 1 sq. in. in cross section, its weight will be 14.7 lbs.; actually our barometers are smaller in cross section than that.

When atmospheric pressure is normal at sea level, the height of the mercury column will be about 29.92 in. Less pressure will cause the barometer to fall, while greater pressure will cause it to rise. Since air density is greatest at the surface of the earth, air pressure will decrease with altitude, this decrease being about 1 in. on the mercury column for every 1,000 ft. up to 10,000 ft. Thus, under normal conditions, the pressure at 6,000 ft. will correspond to 29.92—6 or 23.92 in.

A more practical barometer is the *aneroid* type. Its construction is similar to that of the altimeter discussed in a previous lesson, only the scale being different. The altimeter is calibrated in terms of feet whereas the aneroid barometer can be calibrated in inches, like the mercurial, or in millibars.

Now let us take a look at the methods used by meteorologists for making upper air soundings.

Wind direction and velocity up to 15,000 ft. are determined by means of pilot balloon observations (PIBALS). A balloon filled with hydrogen is allowed to rise, and its drift is observed through an instrument called a *theodolite*, which resembles a surveyor's level.

Instruments for measuring temperature, pressure and relative humidity, a new item we'll learn about in the next lesson, are sent aloft by free balloons in a similar manner or carried in planes. When balloons are used, the balloon bursts at a high altitude because of expansion, and the instrument is lowered on a small parachute. The *radiosonde*, a 2-lb. radio transmitter, is such a device. It transmits to a ground receiving station, radio signals which are translated into readings of temperature, pressure and relative humidity. Free balloons have given us data on the atmosphere up to an altitude of 118,000 ft.

(Next month: Aviation Lesson No. 14—*How Temperature Makes Weather.*)

This series of lessons is for the benefit of aviation instructors, cadets, preflight students and others interested in aviation. When complete, it will furnish a complete text on the subject. Save all the material for study and future reference.

What do you think of these lessons? We will welcome any criticisms or comments you may have in regard to them. Address your mail to: Aviation Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York 18, N. Y.

"Boy! I slept like a log last night!"

It's You . . . and the Rest of the Team

Your big Liberator is coming in fast now . . . boring head-on through black bursts of flak that rock her like a canoe. From your grandstand seat in the greenhouse, you can see fires down below. That's where the first wave laid its eggs. You're next!

Sometimes, back at "pre-flight", it didn't quite add up. Logarithms . . . formulas . . . classes all day. You couldn't see how you'd ever use the stuff they crammed into your head. But you stuck it out. You wanted Bombardier's wings.

The top-turret guns begin to spit, as you hunch down over your bombsight. Check for altitude! Check for air-speed! The guns are going faster now, but you won't let yourself look up. Check for wind-drift! Suddenly you realize you're doing things automatically . . . all the things that came so hard in training. And you're doing them right!

In advanced school you got pretty cocky. Pilots? Navigators? O. K. for some guys maybe. But you're the man they build bombers around! You pack the knock-out punch!

The Lib heels, and straightens out on her target, and Pete comes in over the interphone: "O. K. Slugger. She's yours. Make it good!" You're the boss now. This is what you've been waiting for. You glue your eye to the sight, and talk into your throat microphone: "Level, Pete . . . hold that level. Bomb-bay doors open. Left a little . . . level now . . . level . . . perfect!" And there's your target—caught in the cross-hairs like a fly in a spider web.

You jab the release. *"Bombs Away!"*

Now you've done it! The seconds drag out . . . and then Beezy, back at the tail-gun, yells: "HIT—HIT—HIT—HIT! On target!! Hey, Lieutenant. Come and get your cigar!"

Well . . . ! Your chest starts to swell . . . and then all at once you see that it wasn't just *you* who smeared that Nazi base. It was Pete, up in the pilot's seat . . . Cliff, with his navigation charts . . . the gunners, Jim, Tony, Beezy, Lou. It was you . . . and the *rest* of the crew . . . flying as a team . . .

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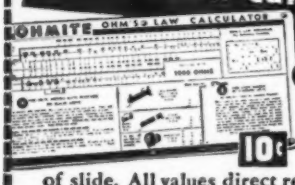

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Landing—On The Enemy

[*Continued from page* 70]

Liberty ship can unload the entire cargo and carry it a mile inland in a surprisingly short time.

Then there is the almost incredible fact that a huge M-10 tank destroyer can pop off the end of a landing craft that couldn't get its ramp clear into the beach, waddle through a depth of nine feet of water and roll up on the beach and without pause start after the enemy. The trick is a waterproofing compound, that applied to the hulls can seal up the tank destroyers, tanks, jeeps and trucks so the equipment comes through safely. Chimney-like scoops from the engine's air intake and from the exhaust keep the motor operating while under water, drive the treads on the floor of the sea. The vehicles with treads drive in. The trucks and jeeps are floated or pushed in by their crews.

Basically the big landing craft are built on the principle of a shallow draft forward with their engines and weightier equipment aft. Thus the bow of the vessel can be run up as close to the shore as possible. As the boat is lightened of its cargo, it floats higher in the water and this assists in getting it off the beach afterward.

One of the hard jobs of the operating crews of small landing craft is to hold the noses of the boats steadily against the shore, so the shallow draft vessels will not broach and swing around broadside to the beach. The boat is less of a target if it stays on a line perpendicular to the shore. Also the propellor must stay in deep water, if possible, so the boat can get away quickly.

The amphibious craft are versatile. While information on some of these is restricted, four types are well known, the Marine Corps alligator and water buffalo, tracked vehicles, the Army duck and the amphibious jeep, wheeled amphibians. The latter looks a good deal like the duck, but has four wheels instead of six and is smaller.

The duck is a 2½ ton, six wheeled truck chassis with a hull built around it. The water buffalo, latest design used by the Marines and gradually replacing the earlier alligator, packs men and cargo; but is also equipped with one .50 caliber and three .30 caliber machine guns mounted on tracks which are bolted on the hull and bulkheads in the cargo compartments. The mounts on which the machine gun pintles are inserted are equipped with rollers and may be moved along these tracks as desired, making fire in all directions possible.

In addition to their easy habit of galloping out of the sea to shore and to destinations in either medium where they are needed, the amphibians have been used for great varieties of new tasks. During operations on Guadalcanal, lack of roads stalled the artillery prime-movers. The alligators not only hauled the artillery, but carried the gun crew and a load of ammunition, the added weight merely supply better traction and assisting in getting the gun across soft spots.

[*Continued on page* 140]

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(pages 26-32)

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Landing—On The Enemy

[*Continued from page* 138]

Casualties have been evacuated direct to the hospital ships by fitting light frames in the tractor body, swimming the patients out to the ship and lifting them aboard, thus saving them some shifting and lifting. Alligators were also used as pontoons for bridges in South Pacific rivers. Mortars have been fired from otherwise inaccessible places by setting them up in cargo compartments and sandbagging them.

The larger landing craft which proceed to the war zone under their own power are armored for splinter protection. The unarmored type is used more extensively where the enemy is not around to make trouble.

Construction of the big craft which proceed across oceans under their own power involved special designs, for a deep draft to get safely across the Pacific and Atlantic, plus a shallow draft for direct landing against a beach was needed. Tests were made at the Navy's David Taylor model basin, where propulsion requirements for different sea conditions were verified and a compromise design worked out.

With all the science possible, however, the large landing craft are not in the most comfortable travelers in the world. Built for landing on shallow beaches, they roll and pitch even when heavily loaded. Their facilities for food and sanitation are well planned, but while they are seaworthy enough to get across the oceans, they are no place for a man with a squeamish stomach.

However, they get there. As William J. Forsythe, Chief Photographer's Mate USCG, a veteran newspaper photographer, wrote from Salerno:

"These amphibious landings are getting monotonous in a ghastly sort of way. They're getting tougher as we go along . . . there was very little enemy activity in the daylight near our ship, but that night I think everybody including Goering himself, must have been flying over us. . . . The Germans were continually laying it on the beach with their mortar shells and 88's. . . . Those 88's sure spread the shrapnel.

"The boat crews that manned the invasion boats certainly deserve credit for continually running back and forth into the beach into the face of heavy enemy fire."

Credit they are beginning to get, as accounts of their work come home. Credit for such work as the landing at Fedala in North Africa, when the landing craft crews made trips in relays for fifty hours without stopping, except when their boats were shot from under them. From the rubber plastic maps of enemy shores showing depths, rocks and reefs, roads and cliffs, that are sent overseas from the model shop at Camp Bradford, Virginia, to the final landing on those modeled shores, the Navy, Coast Guard, Marines and Army are delivering men, guns and equipment in greater quantity and with greater skill as the war progresses.

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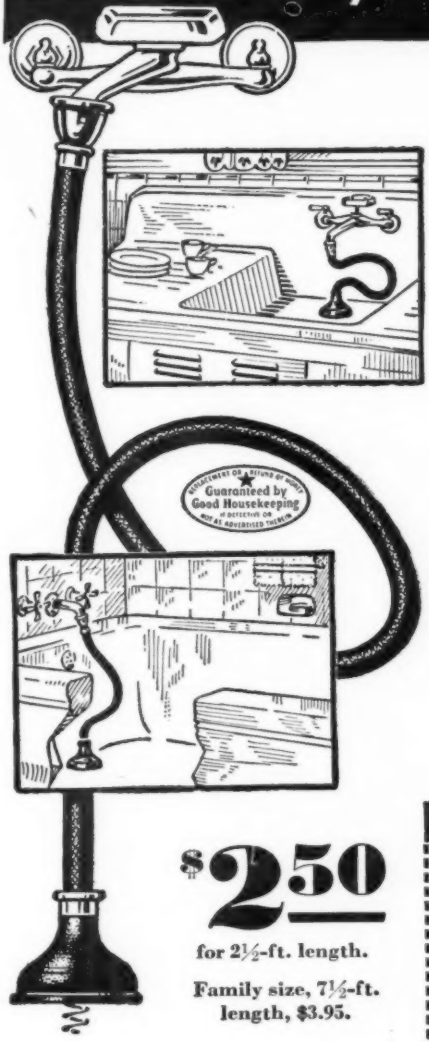

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Happiness

The next section deals with the joy of making things with hands and tools, points out the versatility of the homecraft hobby. Your shop may be anything from a bench with a few simple hand tools to a room full of the finest power tools. The whole family shares in the fun, too, as others join in your activity or enjoy and admire the results.

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Homecraft is a hobby which can pay its own way — with something to spare. Not only can you save money by doing your own minor repair jobs, but you can follow the example of others who have built profitable businesses, making small furniture pieces, etc.

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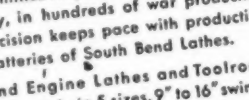

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Continent Of Tomorrow

[*Continued from page 57*]

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So you see what they need down there in Peru—and in all South America—are not only fellows with courage and guts, but *men with ideas.* Here's an example for you to work on: Your eternal fortune will be assured, if you can *bring water to the Peruvian desertland.* That may be your "hunch."

Successful irrigation would make Peru a present of thousands of square miles of brand new territory; rich, productive soil, groundwork for motor roads, sites for cities. Go ask any oldtimer in California what hundreds of miles around Los Angeles was like, before they metamorphosed it with irrigation.

Again, take the case of those pioneer American operators, the Cerro de Pasco mining people. They didn't find all those valuable mineral products growing on trees. Indeed, the property was too far above the timber line for trees, 15,000 feet; among the highest mines in the world. Abandoned mines for the most part, that had been sluggishly and wastefully worked for the past 300 years. The main deterrent had been the prohibitive cost of bringing the ore to mill and market. American enterprise overcame all obstacles, pouring into it both stupendous effort and capital. For one thing, the highest and one of the most costly railroads in the world was constructed right up to the mouth of the mines. They hauled up the most improved mining and milling machinery. Today, they are turning out huge quantities of gold and silver. About 100,000 tons a year of Cerro de Pasco copper are going into the war effort.

W. R. Grace & Company is another American concern that started the ball of progress rolling several decades ago. They saw Peru's extraordinary possibilities and invested in them to the extent of more than $100,000,000. They recognized Peru's chief weakness and went in strong for transportation. Little by little they built up an unsurpassed fleet of luxury-liner passenger-freight steamers that will carry you to Talara, Mollendo or Callao. When the time was ripe, they planned and built up the West Coast Pan American Airways, known as the Panagra, of which they are part owners. Meanwhile, they had built up the largest foreign mercantile and banking business in Peru, with branches at all strategic points, importing from America hardware, provisions, drygoods, coal and lumber. They operate the largest cotton textile mill on the West Coast with 40,000 spindles, using their own cotton. They took a prominent part in the development of

Continent Of Tomorrow

agriculture, scientifically. They not only raised cane and made sugar from it, but also tried out a new process of manufacturing sulphite wrapping paper and cardboard from the cane pulp.

P. S. W. R. Grace & Company can always use the right kind of young Americans.

Only a little more than a year ago, the new hydro-electric plant to develop 110,000 volts, was installed on the Santa Clara River, 250 miles north of Callao. This is only the beginning of what is planned to serve as the site of the new iron and steel industry. Eventually, the whole section, not long ago a wilderness, is to become the national center of all heavy industry, to include cement and chemical works, in view of the adjacent power and mineral resources. The entire undertaking will be staggered over a period of years, at a total cost of not less than $20,000,000.

Finally, the Transandean Highway—a link of the Pan American Highway—has been launched and is now well under way. It will link West Coast Peru with Iquitos and the Peruvian Amazon country and co-operate with the airways. In digging the roadbed they will no doubt plough right through lodes of silver and gold. Anyway, it will open up regions that are just as valuable for other products as for gold and silver.

The government has mapped the whole country into six agricultural zones. For the Peruvians find that they can produce many of the world's most coveted plants, restricted only by the number of intelligent farmers available and the supply of agricultural machinery. Here is a double break for the American in search of the big opportunity. The salesman, for instance, need have little fear of competition for several years to come from an exhausted Europe. Here are some of the products in which Peru may be counted on to hold a front rank: cocoa, vanilla, tobacco, para rubber, sarsaparilla, tea, coconut, Manila hemp, tropical fruits, long staple cotton, sugar cane, indigo, sisal, arrowroot, rice, peanuts, castor beans, dates, figs, olives, coffee, quinine. All tropical, of supermarket value, but suffering little competition in the United States.

Add to these products, flax. The Peruvian Department of Agriculture began prolonged experiments in flax growing in 1933 and has now developed a $4,000,000 crop. In 1941 the cotton crop amounted to 236,000 bales. Sugar rose to 180,730 metric tons. Petroleum ascended to third place in South American production with 16,000,000 barrels. The Marcona iron deposits were found to contain a reserve of 14,000,000 tons.

You never can tell in a country like Peru where your lucky penny is going to turn up. But it's pretty sure to be "heads, you win!"

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WORKSHOP WISDOM

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Greater durability. Highly resistant to water, heat, and age.

Easy to mix. You don't have to heat Casco Glue. It mixes quickly with cold water.

Economical. A little Casco Glue goes a long way. Mix it as you need it. The powder, if tightly covered, lasts indefinitely.

For special outdoor jobs and water projects, experts recommend *Cascamite*—the completely waterproof plastic adhesive.

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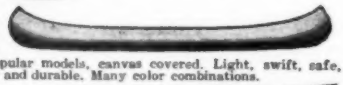

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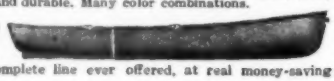

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SEVEN MOST POPULAR

SAIL BOATS

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15½ ft. SNIPE	$230
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282 SPORTSMAN'S BUILDING

BOSTON, MASSACHUSETTS

Castle On The River Nile

[*Continued from page* 43]

challenged by the catastrophic results of our efforts, we refused violently to be thwarted and began to go really to town. Not to the nearest town, where we might hope to find at least something of what we needed, even if at outrageous prices. For that little town lay a thousand miles away, plus two days of march to the so-called road. What we did, instead, was to look around for the free resources of the jungle we had not yet tapped—and to use some imagination.

"What we need," I decided, "is to whitewash the walls. To insulate the floors with cement. To have a couple of good fireplaces. Then we'll get something!"

Ha! But, to start with, by whose magic hat was the quick-lime to be produced? Well, instead, in a nearby stream, we found plenty of fine sand and pure caolin. With a mixture of both, a score of our men rubbed down all the walls in no time—and each room was flooded with new brightness.

The cement we made with a recipe *a la jungle*. You take some antheap soil, crush it to powder, mix it with equal parts of just collected, still warm elephant dung and sprinkle abundantly the whole with goat's urine. After some hours of treading it, the mixture becomes a soft, highly odoriferous paste. You spread it evenly on the floor. When it shows signs of drying, you beat it hard with wooden mallets, until the surface is as hard as stone. A good scouring with "buffalo tongue" leaves, the jungle's own vegetable sandpaper, and the floors are like black marble, absolutely damp-proof, insectproof and, incidentally, odorless, too.

The fireplace stumped the local architectural genuises. But not us. The bricks we made would have fetched nothing but scorn on the American market. There, they looked like a million dollars. And approximately heaped, precariously held together with the stickiest mud, by the end they gave the impression, more than anything else, of cumbersome tombs left by some unknown primitive civilization. But they worked. As soon, that is, as we added a chimney to each of them—a work of art composed of a gasoline drum hoisted on top of a trunk and connected to the hole in the wall by topless, bottomless gas tins, patiently hammered one into the other to form a pipe.

And so it went. My wife eyed with determination an old dress of hers. Some ripping sounds ensued. Some hasty stitching followed. A bit of hammering concluded the matter. And—lo—each window had bright white and red checked gingham curtains.

Our boys knew well how to burn and carve a canoe out of a tree. So, I reasoned, why shouldn't they be able to make a tub out of a trunk? Of ebony, for instance, while we were at it? When finished, it looked like a miscegenation between a coffin and a canoe. All the same, we promoted it to the role of bathtub. Outside, two gas drums perched high, one over a sawed-off stump, the

Castle On The River Nile

other over a rough furnace in which a fire was kept going night and day, supplied cold and hot water. For water pipes we used lengths of bamboo, which we first hollowed with a red hot iron, then slipped through holes in the wall. For faucets we used wooden taps taken off two of our water bags. For drains we took another piece of bamboo, to connect a hole in the bottom of the canoe with the outside ditch. A big cork from a wine jug supplied the stopper.

With our mental muscles flexed by such successful exercises, our ambitions refused to recognize any further limitation.

Some months before, on our way to the jungle, we had inspected the house that a friend of ours, a Mr. C. C. Owtram, had built himself, and completely furnished with exquisite taste, for some $200 in all. True, he lived near a town and was able to obtain a lot of things we couldn't hope to get in the jungle. But—wait a minute! What about the truck that a bull elephant had attacked one black night and smashed to smithereens on the road, shortly before our arrival? We had seen its sad remains piled up near the village of our laborers. All that the owner wanted to salvage had already been taken away. But there were still a lot of empty bicycle cases there. Parts of the truck itself had not been entirely destroyed. And there were also the relics, of all things, of a small upright piano.

Furthermore we had with us some nails, three large cans of paint—red, black and aluminum—a few brushes and tools, even a bolt of cheap cotton cloth originally meant for presents to the natives. And our boys knew where to find ochre of bright red and rich yellow.

Yes, you'll say, but of what good could be such ridiculously absurd items in decorating and furnishing a whole house

You'll be surprised. Examine well the illustrations—and you will see the miracles that can be accomplished by such insignificant ingredients—plus some baskets, floor mats and ceiling reed mats that the wives of our men were only too glad to barter for our empty gas tins.

Take the living room. The ornamental fireplace, so grandly splashed by curved stripes of red ochre, contains no bricks. Some strokes of paint on dried, whitewashed mud supply the effect. The mantel boasts as a rail a board from the lid of the unlucky piano, topped by a semicircle of well-flattened tin from a gas can. The gleaming fender is nothing but a bumper from the defunct truck. The gorgeous flower vase is a *dame-jeanne* of South African wine stripped of its *pudique* dress of woven grass. The pictures on the wall are illustrations cut from magazines, pasted to the wall and framed by the simple expedient of painting some dark lines around them.

Of course, you would think the small table in

[*Continued on page* 149]

Home Craftsmen

Our Government is asking everyone to conserve tools. That's why many types of tools are sold now by your Hardware Dealer *for essential wartime uses only.*

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SURE, that Saturday night pay envelope's bulging. But let me tell you something, brother, before you spend a dime ... *That money's mine too!*

I can take it. The mess out here. And missing my wife and kid.

What I *can't* take is you making it tougher for me. Or my widow, if that's how it goes. And, brother, it *will* make it tough—if you splurge one dime tonight.

You're working ... and *I'm fighting* ... for the same thing. But *you* could lose it for both of us—without thinking. A guy like you could start bidding me right out of the picture tonight. And my wife and kid. There not being as much as everybody'd like to buy—and you having more green stuff than I. But remember this, brother—everything you buy helps to send prices kiting. Up. UP. AND UP. Till that fat pay envelope can't buy you a square meal.

Stop spending. For yourself. *Your* kids. And mine. That, brother, is sense. Not sacrifice.

Know what I'd do with that dough ... if I'd the luck to have it?

I'd buy War Bonds—and, God, would *I* hang on to them! (Bonds buy guns—and give you four bucks for your three!) ... I'd pay back that insurance loan from when Mollie had the baby ... I'd pony up for taxes cheerfully (knowing they're the cheapest way to pay for this war) ... I'd sock some in the savings bank, while I could ... I'd lift a load off my mind with more life insurance.

And I wouldn't buy a shoelace till I'd looked myself square in the eye and knew I couldn't do without. (You get to knowin'—out here—what you can do without.)

I wouldn't try to profit from this war—and I wouldn't ask more for anything I had to sell.

I've got your future in my rifle hand, brother. But you've got both of ours, in the inside of that stuffed-up envelope. You and all the other guys that are lookin' at the Main Street shops tonight.

Squeeze that money, brother. It's got blood on it!

Use it up
Wear it out
Make it do
Or do without

HELP US KEEP PRICES DOWN

A UNITED STATES WAR MESSAGE PREPARED BY THE WAR ADVERTISING COUNCIL; APPROVED BY THE OFFICE OF WAR INFORMATION; AND CONTRIBUTED BY THE MAGAZINE PUBLISHERS OF AMERICA

Castle On The River Nile

[*Continued from page* 147]

front of the mantel is too modernistic to be a makeshift. But it isn't. The top, covered with the omnipresent tin from a metal can, and the bottom, painted in black, both originally belonged to the floor planks of the truck. The two festive supports were salvaged out of the broken handles of two brooms. Polishing by "buffalo tongue" leaves and brightening up with aluminum paint did the rest.

The two inviting armchairs flanking the mantel? Nothing but old bicycle boxes, painted with red and aluminum, and so assembled as to form not only comfortable seats but also combination arm rests, end tables, book and magazine shelves. Black paint applied on bags made of our cotton cloth filled with dried grass produced those stunning cushions imitating a zebra skin. The last touch was supplied by the extra pillows, made out of an old silk kimono and stuffed with hemp.

The other armchair, occupied by the reclining figure of a guest who loved his comforts? Again the same type of cushions, the same wood from ex-bicycle boxes, plus the added beauty of a piece of bent iron from the truck's chassis, sustaining a smart end table—the salvaged windshield. The truck's clock is set in a curved segment of the lid of the piano. The candlestick is nothing but a block of wood, the book-shelves were born as gas boxes. And the miniature chair on one of them emerged from a piece of wire and two bits of the gazelle hide, strips of which had been used wherever necessary to substitute, with the help of some nails, for door hinges. As for the electric lamp topping the bookcase, two empty wire spools and a piece of broom handle did it, the shade being of painted paper and the "juice" stingily supplied, with much coughing, by the portable 32 volt generator of the expedition.

The dining room pictures show china, vases, chairs and a few other ornaments that neither grow in the jungle nor can be obtained from any scrap pile. I will concede that, and confess that we got them later at a small mission about to close. But the dining table was made on the spot, out of just cut mahogany. The serving tables, the round tables, the checked curtains were close kin to those of the living room. The "glass curtains" may be recognized as the mosquito nets which once protected our camp beds. And—believe it or not, the imposing buffet, the elegant china shelves, descended directly from more of the same bicycle and gas boxes.

The latter had their final triumph in the bedrooms. There, not only did they encase the sumptuous mattresses of wild kapok. But they

[*Continued on page* 150]

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Castle On The River Nile

[*Continued from page* 149]

also combined utility with charm by supplying rows of open and closed cupboards, at the foot for shoes and boots, at the head of the bed for books and clothes. There, too, the curved stripes of ochre once more did their stuff—and more effectively than ever. For they also served to center and focus the attention on a head carved by a native sculptor out of elephant ivory and attached to one of the brake blocks of the truck. This pedestal, of course, being painted to harmonize with the general color scheme that the only three cans of paint at disposal had dictated.

Perhaps this quick description will remind you of the old college lyric:

> "I've got a castle on the River Nile—
> I'm going to live there in elegant style—
> Inlaid diamonds on the floor,
> Baboon butler waiting at the door."

And properly so. For the Mountains of the Moon separated our jungle castle from the Nile. And our only baboon was a chimp who, instead of waiting on us, compelled us to wait on him all the time. But, just glance again at the pictures—and try to tell me we didn't live "in elegant style!"

As for diamonds, our marble-like floors of most odoriferous parentage sported none. But you should have seen what our walls of never-completely-dried-mud produced. Regardless of every decoration and ornamentation, each morning, upon waking up, we could look forward to finding them covered with a fresh crop of the most beautiful, multicolored little mushrooms. Poisonous, of course. But show me another castle that can beat that!

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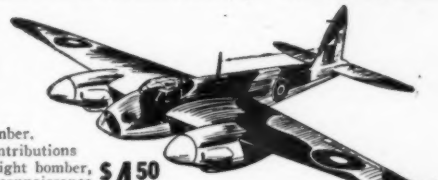

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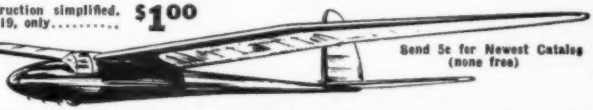

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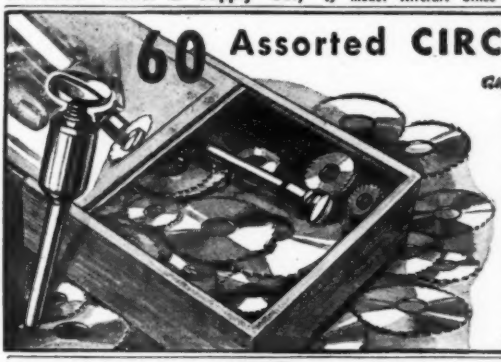

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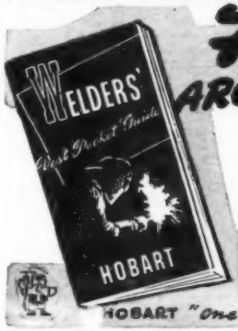

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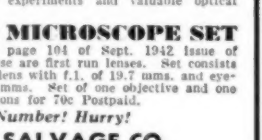

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Cycles Predict The Future

[*Continued from page* 49]

did. The peaks and valleys of Dr. Wheeler's culture curve corresponded with the tree-ring curve so exactly that chance alone could not explain it. Climactic changes, in some way, definitely corresponded with cycles of human activity.

But how? The next step was to collect all available information on climate, as far back as 600 B.C. In time some 20,000 separate items of information, exclusive of tree rings were collected. They give a picture of the climatic cycle as it has extended throughout history.

World climate, Dr. Wheeler found, goes through four stages in its cycle: cold-dry, warm-wet, warm-dry, and cold-wet. His researches have gone far to establish that there *is* such a thing as world climate, which some have doubted. That is, allowing for a few disagreements, wide climatic changes do affect the world as a whole rather than isolated segments.

But the startling meaning of climatic cycles comes from the human phenomena which the succeeding phases bring. Nations are *built* on shifts from cold periods to warm, when human energies temporarily reach a maximum. Nations *crumble* on the shift from warm to cold. Cold droughts and periods of civil war generally coincide. A major cold drought and civil war period occurs about every 510 years, with less severe ones every 170 years—a major cycle breaking again into three minor ones, cycles within cycles.

Where are we now? According to the "drought clock" constructed by Dr. Wheeler, showing cold and warm periods recurring with wavelike regularity from 450 A.D. to the present, the 510-year and the 170-year cycles will coincide around 1980, bringing an era of very cold, dry weather, associated throughout history with great civil wars and the fall of old cultures. The succeeding shift in the cycle is warm-wet, a period of transition in which, temporarily, human energies are high, new nations are built, and a great renaissance occurs. By the year 2000 A.D., according to the cycles, a new Golden Age should be coming into flower, with a revival of genius and learning, art, literature, science, good government.

The world has been generally warm for about 45 years; we have had our hot drought (remember the Dust Bowl?) and are moving on toward cooler times. A need for thicker overcoats and bigger furnaces is the least important message of the cycles, however. What matters is *the kind of human activity the cycles bring with them.*

During hot, dry phases, dictators flourish, minorities are persecuted, liberties are curtailed. "Hitler is a typical hot-drought specimen," says Dr. Wheeler, and it is true that the paperhanger did not rise to power until a dry heat cycle came along. This might seem like proving a point by a notorious example, were not history studded with despots, from the Greek tyrants on down, who have flourished during hot drought periods.

Cycles Predict The Future

Democracy, on the other hand, burgeons during cold phases. The peoples of cool climates have always been more democratic, more resistant to oppression, than those of warm climates who generally tolerate repression, dictation, even slavery.

Cold periods, such as we now appear to be entering, are generally characterized by civil wars and rebellions. Our own Revolution occurred during a great cold period; it was cold in the 1860's when we fought our Civil War. Rebellions in Russia, Germany, and Italy that had much to do with terminating World War I occurred during the temperature drop of 1917 and 1918. But it shortly turned very warm and fascism and tyranny got the upper hand, true to the climatic cycle of history.

Today, entering a cold period as we apparently are, dictators are doomed by the cycles if history repeats itself, and the progress of the war makes this not a probability but a certainty. But the war today, thus far running true to the cycles, is evidently a *nation-falling* war rather than a nation-building one. Before long we should be entering a great civil war epoch, which means a revival of democracy.

It is reasonable to predict, since the present war is running true to form (massacres, pillaging, torturing, fifth column work and disregard for civilian rights have through the ages been typical of warm-to-cold wars like this one) that when the Axis nations are crushed a long period of internal rebellion, chaotic conditions and world instability will ensue. Totalitarian countries will be the bloodiest battlegrounds. Democratic governments have always remained stronger and more stable during the civil war epochs than the despotic ones. In democracies, the greatest unrest will arise from labor troubles, battles of minorities, and intramural struggles.

Will there be another world war following this one? Dr. Wheeler's cycle studies forecast a distinct possibility. There is likely to be a temporary swing to the warm side in the 1950's (corresponding with the minima of the new sunspot cycle we have just entered) and if this is the case a temperature cycle favorable to international wars will be repeated. Whether or not wars follow, international tensions seem due to rise again in the 1950's.

"The tension might not rise to the pitch of producing a world war as early after this one as, say, 1952," says Dr. Wheeler. "It might not gather momentum enough until the late 1950's where I expect a downswing back to the cold period, preceded by a short hot drought . . . turning through cold-wet into the 1960's, where civil wars should break out again."

Cycle studies indicate that the present war may end sooner than expected by many. "If we are now in a transition from a warm to a cold period,

[*Continued on page* 154]

...in your own shop

Surface coatings of rust or gummy film which accumulate on the machined tables and guides of jig saws, band and bench saws are quickly removed and a new precision-looking finish given to machined surfaces by "spot polishing".

The method is simple. The polishing tool (shown above in the Jacobs chuck) is a section of dowel tipped at the working end with a disc of leather or felt. On this disc is put valve grinding compound or powdered emery in oil. The drill press is run at slow speed and the disc brought into contact with the surface to be polished. A few seconds' contact leaves a smooth, bright spot. By repeating the operation, overlapping the spots, a pattern like that illustrated will be obtained.

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Cycles Predict The Future

[*Continued from page* 153]

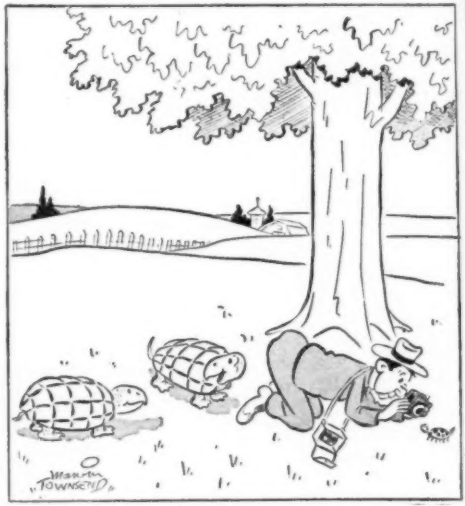
the international battles should drop off soon and civil war battles should increase," Dr. Wheeler predicts.

Lack of space prevents quoting the monumental mass of evidence Dr. Wheeler has accumulated in making his cycle studies. He has had as many as 240 assistants working on the project, compiled 231 world maps, written an 1,800-page book, kept records in a four-foot notebook of 2,000 pages, noted 20,000 climatic items, recorded 18,000 dated battles.

This tremendous effort shows how much work remains to be done in correlating other cycles not touched upon in this study. The very few presented at the beginning of this article hardly scratch the surface. But they show the exciting potentialities of this new way of reading the future. If you are curious to learn whether you were born in a month that produces a high percentage of geniuses, whether 1950 will be a good time to buy a house, the trend of stock prices, whether light reading will be more popular than "think pieces," whether relations between the sexes will be loose or puritanical, in what months your child will grow faster and in which he will hardly grow at all—read in forthcoming issues of MECHANIX ILLUSTRATED the exciting things that cycles enable you to predict about these and hundreds of other subjects.

Research at the University of Nebraska indicates Butadiene, a type of artificial rubber, may be produced from fermentation of starch or sugar.

Correct wheel balance and alignment will enable tires to wear 50% to 100% longer.



"Shall I snap him from this angle?"

From Hawk To Thunderbolt

[*Continued from page* 66]

Palembang, Sumatra, to Koepang, island of Timor. We had a total of 50 Japs to our credit, confirmed as accurately as possible. The Air Defense Command credited our squadron with over 65 shot down. Only 17 of our planes had been lost, and we had also damaged Jap transports and barges with bombs.

Our greatest handicaps were lack of supplies for repair, too few enlisted personnel, and inability to hold the planes out of the air long enough to make overhauls. We felt that the planes did well under the conditions. I was lucky enough to come through without losing a plane in Java, though my last flight nearly ruined my record.

Our P-40's couldn't climb with the Zeros—we had to fight at low ceilings; but our .50 calibre guns dealt heavy blows. I don't have to wonder what we would have done to those Zeros had we been in P-47's. No ship has a higher fighting ceiling—no ship can dive with it—no plane I know can land on all the kinds of terrain, packing the same wallop, for which its wide-track landing gear was designed. So many of our Java losses came from landing accidents. Now we are well on our way back in the Pacific. And I've got my P-40 sheepskin and am sitting in a Thunderbolt!

Magic Cloak Of Invisibility

[*Continued from page* 52]

Chemical Warfare Service's queerest smoke weapons is the Mechanical Smoke Generator, developed principally by Dr. Irving Langmuir of General Electric. This "smoke pot" throws a screen of smoke or fine fog, the nature of which is restricted, and can be used to blot out an entire airfield or even a city within a short time. In Tunisia, enemy dive bombers found it virtually impossible to operate against areas which were protected by the M1.

The Chemical Warfare Service has truly made smoke one of America's greatest weapons of offense and a true "cloak of invisibility."

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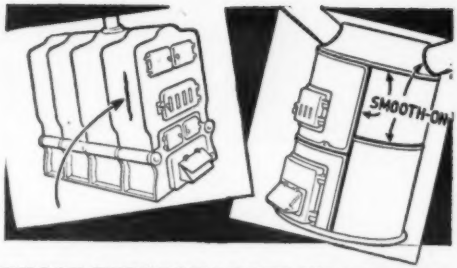
File your income tax return early this year. If withholding tax deductions from your paychecks total more than you actually owe on your 1943 income, the government will refund that balance. There is a good chance that the government does owe you money. The earlier you file your return, the sooner you will get that refund!

In any event, *do not* wait until the last moment to file your return. It is your patriotic duty to file your return before March 15—for 95 cents out of every dollar that you pay the government is spent *directly* on the war.



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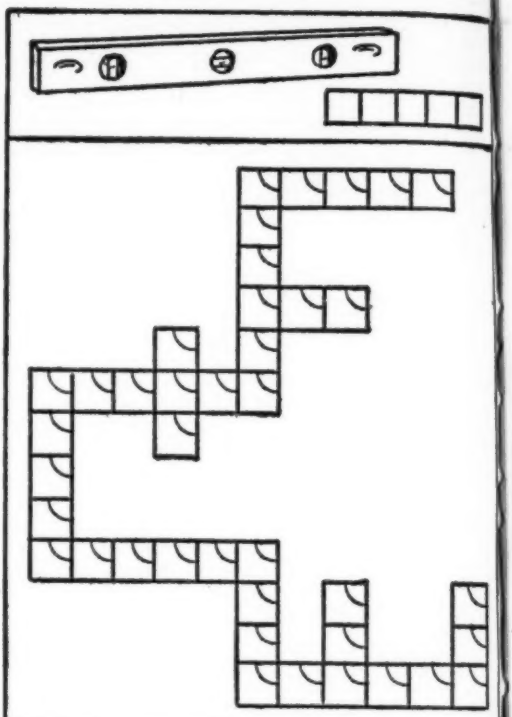

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A — 3	G — 4	M — 1	T — 4
B — J	H — 6	N — 8	U — 1
C — 8	I — 2	O — 3	V — 6
D — 5	J — 7	P — 2	W — 7
E — 2	K — 1	Q — 4	X — 2
F — 7	L — 5	R — 2	Y — 5
		S — 6	Z — 3

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Your Invention Clinic

[*Continued from page 99*]

and imprint the company's seal thereon. On wire tied packages you can always use a lead seal similar to those seals which frequently are put on electric meters. Both items may be applied with reasonable rapidity. But perhaps some of the readers of this column can present you with a more satisfactory design. If so, they may write you directly.

The Terrible Handful

[*Continued from page 38*]

now, hearty as ever, and has sent the sword back to his folks.

Here's Private Rivers who accounted for 100 Japs, who never flinched. Big, barrel-chested, dark-skinned, Rivers had been a boxer, and has a nose that spreads all over his face and cauliflower ears. He had a terrific punch.

Here's George Codrea, the Lieutenant, who brought up the reinforcements, who hastened their arrival by inspiring his men to follow him through Hell cut loose on the point. His six-feet-four frame carries 200 pounds of bone and muscle. Quiet, mild-mannered, modest, he hails from Akron, Ohio, where he went to college and taught history in High School. When he talks about the fight on the point his black eyes sparkle.

Here's Corporal Spillane who fought like the giants of Muirthemne, who always comes through when the going is tough. He comes from South Philadelphia.

Here's Platoon Sergeant Robinson with a voice as loud as a lion's roar, who roared in the pinch and led the last charge. Jut-chinned, with a face cut from rock, he used to be a trolley car conductor in Brooklyn and when aroused has all the fire and kick of a Dodger fan.

Here's Sergeant James Hancock who manned the 37 mm. the second time before he was wounded in the chest and both arms. Platoon Sergeant John Ruth, who can whip himself into one of the snappiest salutes in the Marine Corps, who helped to stave off a Jap charge while his platoon deployed. With Ruth was Corporal Wolfington who seized an abandoned light machine gun in his arms and sprayed bullets at the onrushing Japs until they slumped in a bloody heap.

The day after the battle the nauseating stench of the dead drifted over the island. Jap corpses were piled kneedeep on the spit, in the cocoanut grove on the other side. Jap prisoners stoically picked up their own dead, dumped them into trucks which carried them off to the pits. Jap dead washed up on the sand, floated down the river, were found sprawled on the beach to the east.

When the total count was made it reached over 800, near complete annihilation, and only one Jap surrendered unwounded. Our losses were 26.

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Now, more than ever before, is the right time to patent your invention. Why? Because manufacturers presently engaged in war production are looking ahead to the future by buying up patent rights now, so they will have new and attractive items to make and sell for civilian consumption as soon as the war is over. This is what happened during and after the last war. Hence, the smart thing for you to do is to look ahead to the future too. Protect your invention by applying for a patent now, so you will be in position to cash in on an outright sale, or on the royalties your invention will bring.

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Editor's Workbench Chips

[*Continued from page 16*]

RIDING ON ROPE

Here's a stunt that Don Martin, 435 N. Mentor, Pasadena, Calif., worked out to replace high pressure bike tires that are no longer serviceable. Either ½-inch or ⅝-inch rope will do the trick, according to Don. Simply put the rope on as shown above, using rim cement to hold it. Old pieces of cloth may be wrapped around it to hold it while the cement sets. A $3.00 Workbench award and a Certificate of Merit go to Mr. Martin for this bike tip.

get it. It's only the beee-ginning, folks, only the beginning! Because in 1944 we've got to do even better.

The goal for this year is up by a couple of million—Uncle Sam asks us to plant 22,000,000 gardens, so you'd better get ready to spade up a few more square yards than you did last year. We're going to help you, too, with an article in the April issue of MECHANIX ILLUSTRATED on how to make your garden for 1944 better and more productive than ever. Watch for it.

Next Month

A preview in brief of what we think will grab and hold your interest in our April issue starts out with:

LONG TOM: Willy Ley, MI's armament expert, tells about the famous American 155mm rifle, the gun that a captured German officer swore was automatic artillery. Enemy tanks and fortifica-

tions in North Africa felt its punch first. Now the Long Toms are in Italy.

SECRET WEAPONS: Have the Nazis got anything that might change the present disastrous complexion the war has taken on for them? Major Wheeler-Nicholson goes into that news-hot subject thoroughly.

SONS OF MARTHA: The largest employer of civilians in America, the Air Service Command, has the tremendous job of seeing to it that thousands and thousands of parts arrive on the dot for battles everywhere. It is also the boss of those thirteen vitally important guys, the ground crew for every American bomber taking off for Berlin. The inventive, on-the-spot genius of some of these men at battlefronts is almost beyond belief, even for Yanks.

April Crafts and Hobbies

Just a word about some of the interesting things you'll find in the above section of next month's issue, in addition to the Victory Garden article.

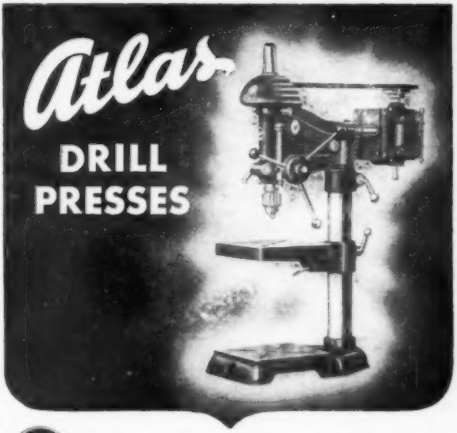
MITE CYCLE—Gasoline won't be too plentiful this spring, so this little scooter powered by a ⅝ h.p. engine will be just the thing for short trips to town, to see friends or for marketing.

DYNAMIC DEMONSTRATOR—You can easily learn the fundamentals of radio and electronics by building and operating this gadget, which graphically portrays the inner workings of a radio circuit.

HAWKER TYPHOON—Flying Scale U-control model of this famous RAF fighter plane.

16-FOOTER BY A 14-YEAR-OLD

Lloyd Eisenhauer, Lunenburg, N. S., Can., built this trim 16-footer when he was 14 years of age. The boat has been in use for the past three summers, and according to its builder, is the "stiffest boat in the harbor." It brings Mr. Eisenhauer a $3.00 Workbench award.



War production records are being set today with these high speed modern tools. Atlas Drill Presses get first call in many an industrial plant because their rugged construction — and special Atlas 4 SKF bearing "floating drive" spindle design — assures long, continuous, accurate service. Make your next "drill" an Atlas. Atlas Press Company, 352 North Pitcher Street, Kalamazoo, Michigan.

ARMY E NAVY

VICTORY FIRST! -THEN Atlas TOOLS FOR YOU

USE IT FOR *ALL* KINDS OF MEASURING

Make those difficult measurements quickly, easily with this Master Streamline steel tape rule. Use it for inside measurements, outside measurements, for calipering rounds. With this Master Streamline you avoid inaccuracies that mean wasted hours of "cut and try".

Patented lever lock holds reading indefinitely. Pistol-butt case aids cramped-space measuring.

Easily inserted spare blade doubles life of rule, an exclusive Streamline feature.

Write today for this handy pocket sized 16 page booklet "Rules for Measurement."

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Enclosed $2.65 covers one Master "Streamline" 6-ft. Steel tape rule and spare blade.
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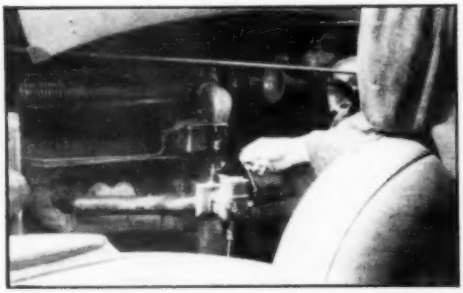
Your Wartime Car

by Frederick C. Russell

If you have a problem with your car, ask Mr. Russell. Just send a stamped, self-addressed envelope for a personal reply.

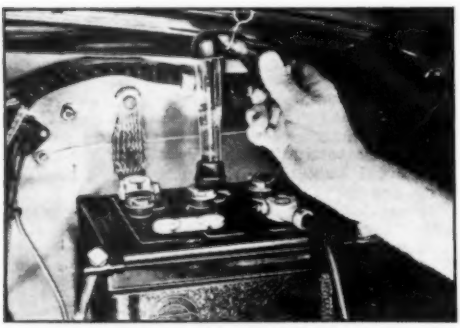
What is meant by "metered flow" when referring to engine lubrication? S. N. B., Jr.

The oil is fed to bearings in metered quantities rather than by free flow.



Gas mileage has been very low lately, in spite of careful adjustments and use of a rather lean mixture. K. N. McB.

Take a look at the choke control rod after the engine has warmed up. You may find that the heat control fails to open the choke fully.



Because of cramped quarters it is impossible to take a hydrometer reading of the battery solution. What can I do about it? G. G. S.

There is a special hydrometer for this purpose. It has an offset bulb.

I am getting an annoying engine knock under all conditions. Bearings have been replaced. L. L. K.

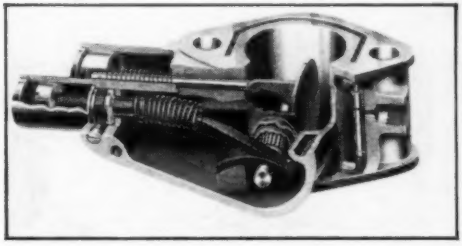
The chances are that the knock in your car is caused by a loose valve guide.

Try it!

Since it is sometimes difficult to tell whether a cylinder head gasket has been the cause of water leakage even after taking off the head, real savings can be effected by testing for leakage with compressed air introduced into each cylinder through a fitting screwed into each spark plug in turn. Air from a filling station pressure line will be sufficient for this. When air is introduced there will be a quick rise of water in the radiator if there actually is head gasket leakage. Since the air will tend to drive down the pistons you must "brake" the engine during the test by putting the car in gear with brakes set.

What care should the spare tire receive? C. C. H.

It should be put into service when you rotate tires. Avoid all unnecessary parking in the hot sun. If it is held in place by a metal clamp be sure the clamp does not injure the tire by too much pressure.



The used car I just bought is equipped with a governor provided with a dash adjustment and a lock. Can you show me by means of a sketch how this device controls the throttle valve? G. Mc. N.

The accompanying photograph shows all working parts in detail.

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